DATE DUE:
AUG 17 2007

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#7

# JOB COMPLETION REPORT
# DEVELOPMENT AND OPERATIONS

Project No. F-26-D-1

Name: Miles City Fish Pond

Job No. I

Period Covered: July 1, 1958 to January 1, 1959

Date Started: July 22, 1958

Date Completed: Inspected and approved by John W. Waldron, Assistant Department Engineer, November 20, 1958.

Work Accomplished: Dikes constructed, pumps and pipelines installed in accordance with P.S. & E. and amendments thereto.

Unused Material: None

Prepared by: George D. Holton
George D. Holton
Assistant Coordinator

Approved by:
Walter M. Allen
Coordinator

Helena, Montana
March 6, 1959

FAF-Montana
F-26-D-1
Miles City Fish Pond

Regional Director
Bureau of Sport Fisheries and Wildlife
P. O. Box 3737
Portland 8, Oregon

Dear Sir:

Presented herewith our documents representing the final completion report for project F-26-D-1, the Miles City Fish Pond.

Very truly yours,

W. J. EVERIN
STATE FISH AND GAME DIRECTOR

WJE:bas

Encl.

31B VI
#6

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

# JOB COMPLETION REPORT
# DEVELOPMENT AND OPERATIONS

State of Montana

Project No. F-25-D-1

Job No. I

Period Covered Oct. 1, 1957 to Dec. 1, 1958

Name Western Montana Fishery Study

Title Rainy Lake Fish Barrier

Date Started: November 7, 1957

Date Completed: Inspected and approved by C. K. Dalton, Montana Fish and Game Department Engineer on December 10, 1957.

Work accomplished: A log-crib fish barrier dam was constructed, the stream channel was enlarged and the flow line changed in accordance with the Plans, Specifications and Estimates.

Unused materials: Negligible.

Prepared by: Arthur N. Whitney
Project Leader

Date: December 11, 1957

Approved by George D. Holton
Assistant Coordinator
Fed. Aid in Fish Restoratio
Section of Fishery Div.
Mont. Fish & Game Dept.

Sheet No. 1

STATE FISH AND GAME COMMISSION OF MONTANA

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# PROPOSAL FORM

Fish and Game Project No. 118 Missoula County

Name of Project Rainy Lake Fish Barrier

✓ Name of Bidder Marshall Gray

✓ Address of Bidder Seeley Lake, Montana

To the
STATE FISH AND GAME COMMISSION,
Helena, Montana

Gentlemen:

In submitting this proposal for the performance of certain work and the furnishing of certain materials, constituting improvements proposed and specified in connection with .................. Project No. 118, known as Rainy Lake Fish Barrier .................. in Missoula County, Montana, the undersigned agree........ that:

(1) The only persons interested in this proposal are those whose signatures are attached hereto; (2) This proposal is submitted without collusion with any other bidder; (3) He has They have carefully examined the plans, specifications, special provisions and all other pertinent documents and understand.... the meaning intent and requirements of same; (4) He has They have carefully examined the site of the work and is are familiar with the nature of the improvements and the conditions under which they will be prosecuted; (5) He They understand.... that the quantities estimated are approximate only and subject to increase or decrease and that He They will perform the necessary work in increased or decreased quantities at the unit prices bid; (6) He They will furnish all equipment, labor and material and do all the work necessary to the proper completion of the improvements, in the manner and time specified and in strict conformity with the contract, including the plans, specifications and special provisions pertaining thereto, for the following unit prices and/or lump sum bid, to-wit:

MILES CITY

Rainy Lake Fish Barrier Project No. 118 Sheet No. 2

| Item No. | Approximate Quantities | Items and Unit Prices Bid (Written in Words) | Unit Prices Dollars | Unit Prices Cents | Amount Dollars | Amount Cents |
|---|---|---|---|---|---|---|
| | | AMOUNT CARRIED FORWARD None –<br>Contractor's Name Marshall Gray<br>Contractor's Class C License No. 2305<br>**Note: The Bidder Must Extend and Total His Bid.** | | | | |
| | | Only lump sum bids will be accepted.<br>To include:<br>All excavation, all material except treated rough lumber, all backfill, all cleaning and grubbing, all hardware and all labor and equipment. | | | $ 6 488 | 56 |
| | | Total Lump Sum Bid | | | $ 6 488 | 56 |

The undersigned further agree... that:

(7) He They will perform all extra work on the basis set forth in the specifications; (8) If awarded the contract for this work he they will, within ten (10) days after the date of the award, execute the prescribed contract agreement, will begin work within ten (10) days thereafter and complete the same on or before January 31, 1958; (9) If awarded the contract for this work he they will deposit a contract bond and guarantee in a sum equivalent to one hundred per cent (100%) of the amount of the contract, such contract bond and guarantee to conform in every respect to the requirements of the specifications.

Accompanying this Proposal as a guarantee of good faith is an unconditional certified or cashier's check drawn on the Money Order Bank of ........ Montana, in an amount of ........ Dollars ($73.0 00) being not less than five per cent (5%) of the total amount of the bid, and made payable to the State Fish and Game Commission. It is understood and agreed that this check is to be forfeited to the use of the State of Montana in case the undersigned shall fail or refuse to comply with the provisions of the specifications referring to the execution of the Contract agreement.

Respectfully submitted,

Marshall Gray
(Bidder's Name)

Seeley Lake Montana
(Bidder's Address)

By Marshall Gray

Title Owner
(Authorized Agent)

Dated at Seeley Lake, Montana, this 12th

day of October, 1957

MILES CITY ★

Helena, Montana
September 25, 1957

# NOTICE TO CONTRACTORS

Notice is hereby given that sealed bids for the construction of the improvement hereinafter described will be received by the State Fish and Game Commission of Montana at the offices of said Commission in Helena until 11:00 A.M. on October 15, 1957, the bids being publicly opened and read immediately thereafter.

> Rainy Lake Fish Barrier, located downstream from Rainy Lake in Section 11, Township 18 North, Range 16 West in Missoula County.

Each proposal must be submitted on a form and in an envelope to be provided for the purpose, addressed to the State Fish and Game Commission at Helena, and endorsed, "Proposal for Improvement."

Plans, forms of contract and bond, proposal blanks and full instructions are on file for examination and may be obtained at the office of the Fish and Game Commission in Helena, Montana.

The Commission reserves the right to reject any or all bids and to waive technicalities as may be deemed necessary in the interest of the State. No bids will be considered except those from contractors ascertained to be experienced and responsible.

STATE FISH AND GAME COMMISSION OF MONTANA

BY: A. A. O'CLAIRE, SECRETARY

Published - September 27, October 4 and 11

From:Montana Fish and Game Commission Minutes - Monday, October 14, 15, 1957

Tuesday, October 15, 1957

RAINY LAKE FISH BARRIER -- At 11:00 a.m. bids were opened as follows:

| | |
|---|---|
| Liberty Construction Company, Route 3, Missoula, Contractor's License No. A-851 | $12,450.00 |
| Gray Lumber Company, Seeley Lake, Contractor's License No. C-2305 | $ 6,488.56 |

Y-1B 4
#6
✓

MONTANA FISH AND GAME DEPARTMENT

CHEMICAL REHABILITATION, POST-TREATMENT REPORT

Project Name Statewide Lake & Stream Rehabilitation Project Number F-24-D-40

Date Submitted May 7, 1971

Lake or Stream Lake Abundance 22-7[illegible]2 T. 8 South R. 14 East S. 32

County Park County

Date of Chemical Treatment September 5, 1969

1. Surface Area at Treatment 33 (acres) Water Volume 660 Acre-ft.

   Miles of Tributaries Treated None Stream flow ____ cfs.

2. Miles of Stream Treated None Stream flow ____ cfs.

   Miles of Tributaries Treated None Stream flow ____ cfs.

3. Toxicant Used Pro-Noxfish

4. Amount and Concentration of Toxicant Used:

   Lake 240 gallons Stream ____

5. Method used in distributing the Toxicant:

   Lake: Prop wash of boat and back pump Stream:

6. Cost of Toxicant $ 864.00

7. Condition of water on date of treatment:

| Depth or flow (feet) | Temperature (°F) | pH | Dissolved Oxygen Content |
|---|---|---|---|
| Average 20 feet | 40° F | Not taken | Not taken |

TDS Not taken

8. Species and estimated numbers of fish eradicated:

Lake: Cutthroat trout - many
Lake chub - many

Tributaries:

9. Period of Toxicity At least until ice cover formed on lake in November - still toxic in March 1970

10. Method of determination of effectiveness:

Live cars and test fish plus visual observation

11. Detoxification required None. If so, report on effects recorded on downstream fishery.

12. Fish Stocking:

| Date | Species | Size (inches) | Pounds | Number |
|---|---|---|---|---|
| 7-15-70 | Yellowstone Cutthroat Trout | 6" | 610 | 5,000 |

13. Status of fishery, if applicable (creel census, gill or trap net) growth. Record method of sampling.

Reports of catches of 9-11" cutthroat caught late fall

14. Comments on angler use (before and after treatment)

Fish were in poor shape and not in favor with fishermen. Some fish being caught, look for better summer 1971.

15. Public reaction to project (before and after treatment)

Public favored project as a result of two successful previous projects.

16. Additional Remarks

It appears at present that the project was successful in eliminating the lake chub as a cutthroat competitor. An additional stocking of the same species will take place this year. Natural spawning should then take over.

Prepared by Clinton G. Bishop

Date May 10, 1971

8134
#5
✓

MONTANA FISH AND GAME DEPARTMENT

CHEMICAL REHABILITATION, POST-TREATMENT REPORT

Project Name Statewide Lake & Stream Rehabilitation Project Number F-24-D-39

Date Submitted August 13, 1968

Lake or Stream Kersey Lake 22-8274 T. 9S R. 15E S. 22,23,26,27

County Park

Date of Chemical Treatment August 29, 1968

1. Surface Area at Treatment 118 (acres) Water Volume 4,716 Acre-ft.

   Miles of Tributaries Treated 3 miles Stream flow 6-8 cfs.

2. Miles of Stream Treated None Stream flow ______ cfs.

   Miles of Tributaries Treated None Stream flow ______ cfs.

3. Toxicant Used Pro-Noxfish

4. Amount and Concentration of Toxicant Used:

   Lake 1,610 gal. Stream 10 gal.

5. Method used in distributing the Toxicant: Boat and back pump

   Lake: Stream:

6. Cost of Toxicant $ 5,524.20

7. Condition of water on date of treatment:

| Depth or flow (feet) | Temperature (°F) | pH | Dissolved Oxygen Content |
|---|---|---|---|
| 68 feet - Max.<br>40 feet - Avg. | 40°F | Not taken | Not taken |

TDS Not taken

8. Species and estimated numbers of fish eradicated:

Lake: Brook trout - many
Lake chub - many

Tributaries: Brook trout - many

9. Period of Toxicity At least until ice cover formed on lake in November. Not toxic in March.

10. Method of determination of effectiveness: Gill nets and live-cars

11. Detoxification required None. If so, report on effects recorded on downstream fishery.

12. Fish Stocking:

| Date | Species | Size (inches) | Pounds | Number |
|---|---|---|---|---|
| April 4, 1969 | Cutthroat Trout | Surplus brood | 2-4 lb ea | 500 |
| When ice is gone | Cutthroat trout | 5-7" | 200 | 2,000 Est. |
| When ice is gone | Cutthroat trout | Fingerlings | 200 | 20,000 Est. |

13. Status of fishery, if applicable (creel census, gill or trap net) growth. Record method of sampling.

Newly stocked - no fishing as yet due to ice cover.

14. Comments on angler use (before and after treatment)

Before - fair fishing for pan-size brook trout.
Ice cover not off yet, so no after remarks.

15. Public reaction to project (before and after treatment)

Some people were skeptical about value of the project until Rock Island Lake came back into production. After seeing dead chubs people were happy and have requested other rehabilitation in the area.

16. Additional Remarks

Local people were surprised at the numbers of chubs that showed up in the kill and are happy with the work. Planting is not completed, but will be this summer.

Waters referred to: 22-8274
Sedge Creek - tributary to above water
22-9030

Prepared by Clinton G. Bishop Date April 23, 1969

91841
#4

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-24-D-38

Name: State-wide Lake and Stream Reclamation

Job No. I

Title: Rehabilitation of Lake Five, Halfmoon and Mud Lakes

Period Covered: March 4, 1968 to June 30, 1968

## ABSTRACT:

Lake Five, Halfmoon, and Mud Lakes and their interconnecting waters were chemically treated with a rotenone base toxicant (Pro-noxfish) on May 15 and 16, 1968 to eradicate over abundant populations of non-game species. The species of fish removed were pumpkinseed, Lepomis gibbosus; longnose sucker, Catostomus catostomus; northern squawfish, Ptychocheilus oregonsis; brook trout, Salvelinus fontinalis; arctic grayling, Thymallus arcticus; cutthroat trout, Salmo clarki; and smallmouth bass, Micropterus dolomieui.

Post-treatment investigation conducted in July after detoxification indicated that a complete kill of non-game species was not attained.

Halfmoon and Lake Five were restocked with westslope cutthroat trout. Mud Lake was restocked with brook trout.

## RECOMMENDATIONS:

Continue managing these lakes for trout species. Periodically, collect fish population data with gill nets to determine the growth and survival of trout introductions and the relative population abundance of non-game species.

## OBJECTIVES:

The purpose of this project is to (1) remove over abundant populations of non-game species affecting growth and survival of trout species and (2) restore these lakes to a trout fishery.

## TECHNIQUES USED:

Lake volumes were computed from lake contour maps drawn from electronic sounding records. Lake Five has a surface area of 235 acres with a volume of 2,993 acre feet. Halfmoon Lake has an area of 61.4 surface acres with a volume of 374 acre feet. Mud Lake has a surface area of 12 acres with a volume of 280 acre feet.

Chemical treatment was accomplished on May 15 and 16, 1968 using a rotenone base toxicant (Pro-noxfish) at the rate of 1.0 ppm. A total of 1,320 gallons of toxicant was distributed in the three lake system.

A 14-foot boat, operated by one man and equipped with a venturi pump, was used to distribute toxicant in the deeper waters of the lake. A two man boat crew, equipped with a water pressure pump, distributed toxicant along the shoreline areas. Several men, equipped with back-pack fire pumps, sprayed swampy areas along the shoreline too shallow for boat travel. A prolonged metered flow of toxicant was released in the interconnecting stream system. Metered flows of toxicant were released at the outlet of Halfmoon Lake (tributary to Lake Five) and at the inlet source to Mud Lake.

Post-treatment investigations included placement of live cages of fish in Lake Five and Mud Lake to determine if detoxification had occurred. Gill nets were set to determine if a complete kill had been accomplished.

## FINDINGS:

Distressed fish began surfacing within 2 hours after the application of toxicant. Small pumpkinseed, 2-4 inches, were the first to succumb.

The species of fish eradicated in order of abundance were: pumpkinseed, longnose suckers, northern squawfish, brook trout, smallmouth bass, and arctic grayling.

In mid-July, approximately 2 months after the lakes were treated, live cages of fingerling cutthroat were placed in Lake Five and Mud Lake. No mortality had occurred after remaining in the lakes for a period of 2 weeks.

A remnant population of suckers and pumpkinseed survived the chemical treatment. A few suckers were collected from gill nets set in Lake Five and several live adult suckers and one pumpkinseed were observed along the shoal areas.

In late July, 1968, westslope cutthroat trout were stocked in Lake Five and Halfmoon Lake. Lake Five received plants of 64,720 fry, 2,660 6-inch, and 2,161 16-inch fish. Halfmoon Lake received plants of 21,120 fry and 760 14-inch fish. In the fall of 1968 Mud Lake was restocked with 4,800 5-inch brook trout.

By mid winter 1969, good catches of cutthroat trout from the 6 and 16-inch plants were reported from Lake Five.

Prepared by: Robert Domrose
Date: April 10, 1969

Approved: George D Holton

Waters referred to:
08-8550
08-8700
08-9320

B134
#3

MONTANA FISH AND GAME DEPARTMENT

CHEMICAL REHABILITATION, POST-TREATMENT REPORT ✓

Project Name Coopers Lake    Project Number F-24-D-37

Date Submitted August 7, 1967

Lake or Stream Lake    T. 15N R. 10W S. 6-7

County Powell

Date of Chemical Treatment Sept. 12, 1967

1. Surface Area at Treatment 182.5 (acres)    Water Volume 7364.8 Acre-ft.

   Miles of Tributaries Treated 4    Stream flow 1-5 cfs.

2. Miles of Stream Treated none    Stream flow -- cfs.

   Miles of Tributaries Treated none    Stream flow -- cfs.

3. Toxicant Used Emulsifiable rotenone

4. Amount and Concentration of Toxicant Used:

   Lake 1 PPM (Parts per million)    Stream 1 PPM+

5. Method used in distributing the Toxicant:

   Lake: Boat and venturi pumps    Stream: Drip stations
   Back pumps

6. Cost of Toxicant $ 9,322.00

7. Condition of water on date of treatment:

| Depth or flow (feet) | Temperature (°F) | pH | Dissolved Oxygen Content |
|---|---|---|---|
| Lake: 55 feet | See attached table | 7.8 | Surface 8.3 PPM |

TDS Not measured

8. Species and estimated numbers of fish eradicated:
   Longnose sucker - catostomus catostomus (Forester) - FSu

Lake: Northern Squawfish - Ptychocheilus oregonensis (Richardson) - SQ
Cutthroat trout - Salmo Clarki (Richardson) - Ct
Rainbow trout - Salmo gairdneri (Richardson) - Rb
Tributaries: Redside shiner - Richardsonius balteatus (Richardson)

Same as lake

7. Condition of water on date of treatment:

| Depth | Temperature (°F) |
|---|---|
| 0 | 62 |
| 5 | 62 |
| 10 | 62 |
| 15 | 62 |
| 20 | 62 |
| 25 | 62 |
| 29 | 61 |
| 30 | 61 |
| 31 | 60 |
| 32 | 59.5 |
| 33 | 59 |
| 34 | 57.5 |
| 35 | 56 |
| 36 | 55 |
| 37 | 54 |
| 38 | 52 |
| 39 | 51 |
| 40 | 51 |
| 45 | 49.5 |
| 50 | 48.5 |
| 53 (bottom) | 48.5 |

9. Period of Toxicity Approximately 30 days

10. Method of determination of effectiveness:

Gill netting and Scuba

11. Detoxification required No. If so, report on effects recorded on downstream fishery.

12. Fish Stocking:

| Date | Species | Size (inches) | Pounds | Number |
|---|---|---|---|---|
| Lake- July 1968 | W.S. Cutthroat | 1-2" | --- | 72,800 |
| Tributaries - July 1968 | W.S. Cutthroat | 1-2" | --- | 2,500 |

13. Status of fishery, if applicable (creel census, gill or trap net) growth. Record method of sampling.

To be gill netted spring 1969

14. Comments on angler use (before and after treatment)

Unsatisfied before treatment After treatment unknown

15. Public reaction to project (before and after treatment)

Favorable

16. Additional Remarks

Prepared by Boyd L. Opheim Date April 15, 1969

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

B1641
#2

JOB COMPLETION REPORT
DEVELOPMENT PROJECT

State of Montana

Project No. F-24-D-36

Name Statewide Lake and Stream Rehabilitation

Alva-Inez Area

Period Covered: June 30, 1965-July 1, 1966

## Abstract:

Alva and Inez Lakes in west central Montana, containing 68,704 acre feet of water and 24 miles of tributaries, were rehabilitated in the fall of 1965. This area, known as the Upper Clearwater, is located approximately 60 miles northeast of Missoula, Montana. Approximately 8,500 gallons of emulsifiable rotenone were applied by boat and helicopter. This treatment was to remove pumpkinseed (Lepomis gibbosus), yellow perch (Perca flavescens), northern squawfish (Ptychocheilus oregonensis) and peamouth (Mylocheilus caurinus). Westslope cutthroat fry were planted in the spring of 1966, and at time of writing this report (May 1967), are furnishing excellent fishing.

## Objectives:

To remove as completely as possible the existing fish populations in the Clearwater River drainage between Rainy Lake and the fish barrier below Inez Lake. To reestablish a fishable westslope cutthroat population.

## Techniques Used:

On September 20-21, 1965 Alva and Inez Lakes and their tributaries were treated with 1 ppm emulsifiable rotenone. The main lakes were treated by three power boats dispensing toxicant through underwater venturies. Littoral zones and marsh areas within the project area were treated by boom spraying from a helicopter. The remaining running water areas were treated with 20% rotenone dispersible powder. No toxicant was applied above the upper limits of warm water fish in the tributaries. A total of 8,415 gallons of emulsifiable and 900 pounds of 20% rotenone dispersible powder were applied.

## Findings:

Considerable difficulty was experienced in acquiring the necessary amount of toxicant. The original supplier could only furnish about half of the required amount in time for the project, the remainder had to be procured from another supplier very late in the season.

Pre-treatment surveys determined that rough fish, excluding suckers, were confined to the lakes and the lower ends of their tributaries. Good populations of cutthroat trout (*Salmo clarki* Richardson) and Dolly Varden (*Salvelinus malma* Walbaum) were left undisturbed in the upper portions of the tributaries. The following is a list of common names, abbreviations used, and scientific names of fish killed in descending order, by number observed.

| Common Name | Abbreviation | Scientific Name |
|---|---|---|
| Yellow perch | YP | *Perca flavescens* (Mitchill) |
| Pumpkinseed | PS | *Lepomis gibbosus* (Linnaeus) |
| Common sucker | C Su | *Catostomus commersoni* |
| Largescale sucker | C Su Col | *Catostomus macrocheilus* Girard |
| Northern squawfish | SQ | *Ptychocheilus oregonensis* (Richardson) |
| Peamouth | CRC | *Mylocheilus caurinus* (Tichardson) |
| Longnose sucker | F Su | *Catostomus catostomus* (Forster) |
| Kokanee | KOK | *Oncorhynchus nerka* (Walbaum) |
| Mountain whitefish | Wf | *Prosopium williamsoni* (Girard) |
| Cutthroat trout | Ct | *Salmo clarki* Richardson |
| Dolly Varden | Dv | *Salvelinus malma* (Walbaum) |
| Rainbow trout | Rb | *Salmo gairdneri* Richardson |

Scientific and common names are those listed in the American Fisheries Society Special Publication #2, 1960.

Post-treatment work included gill netting to test the completeness of kill. Gill net sets in both lakes during the detoxification period caught no fish. Live cages with test fish were used in each lake to determine when the lakes detoxified. No fish were caught in gill net sets in both lakes until June of 1966. Inez Lake had detoxified by November 16, 1965. Alva Lake did not clear until December 15 of this same year. Approximately 250,000 1-2 inch westslope cutthroat were stocked after this clearing period.

In June of 1966 two 24 hour experimental gill net sets were made in Alva Lake. Ten westslope cutthroat trout ranging in length from 4.4 to 10.4 inches and one Dolly Varden 12.4 inches long were taken. Seven longnose suckers ranging in length from 8.2-12.2 inches were also caught. One 8 inch Dolly Varden and one westslope cutthroat 9.3 inches in length were taken in the Inez Lake set.

At the time of writing this report fishing is excellent in both lakes for westslope cutthroat ranging in length from 10.0-16.0 inches. Further studies will be conducted and reported under the F-12-R project.

Prepared by Boyd R. Opheim

Approved by George D Holton

Date June 1, 1967

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

B1B4
#1 ✓

JOB COMPLETION REPORT
DEVELOPMENT PROJECT

State of Montana
Name: Statewide Lake and Stream Rehabilitation
Project No.: F-24-D-35
Title: Rehabilitation of Dahl Reservoir
Period Covered: August 22, 1960 to September 23, 1960

## Abstract:

Dahl Reservoir, a stockwater reservoir of approximately 9 surface acres located in Phillips County, was treated with forty-two gallons of Pro-Nox Fish on September 13, 1960 in order to remove the fish population present. Stunted yellow perch had been collected previously by gill netting. Crappie were also noted at the time of application of toxicant. Gill nets set one week after application of toxicant and left for two days captured no fish.

## Objectives:

To remove the fish population from the reservoir so that it could be replaced with a species which could be more satisfactorily managed to provide sport fishing.

## Techniques Used:

On September 13, 1960, Dahl Reservoir was treated with forty-two gallons of a commercial rotenone-base fish toxicant, Pro-Nox Fish. Application was accomplished by siphoning the undiluted toxicant from a small drum over the transom of a boat into the prop wash by means of a hose fastened to the lower portion of the boat's outboard motor. Water volume at the time of application was estimated at seventy acre feet. Rate of application was about 1.8 ppm of the liquid emulsive.

## Findings:

Shortly after application of toxicant had begun, distressed and dying fish appeared on the surface of the water. Species noted were yellow perch, previously collected by gill netting in September 1959, and crappie, which were not known to be present in the reservoir. Observations of dead fish along the shore on September 20, 1960, did not disclose any species other than those mentioned above.

Gill nets set on September 20, 1960, and lifted on September 22 captured no fish. Since the reservoir is a small runoff fed body of water with no springs, extensive emergent vegetation beds or other factors which would hamper application and diffusion of the toxicant, it is quite likely that a complete kill was accomplished.

## Recommendations:

It is recommended that rainbow trout fry or fingerlings be introduced into the reservoir in 1961.

Prepared by: Cliff W. Hill
Approved by: George D Holton
Date: September 23, 1960

MONTANA DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

B1B40
#9 ✓

# JOB COMPLETION REPORT
# DEVELOPMENTS AND OPERATIONS

State of Montana

Project No.: F-24-D-34 Name: Statewide Lake and Stream Rehabilitation

Job No.: I Title: Rehabilitation of Crandall Reservoir

Period Covered: September 1, 1960 -- December 31, 1960

## Abstract:

Crandall Reservoir, a twenty acre stock pond in Roosevelt County, was treated with Pro-Nox Fish on October 11, 1960 to remove a population of various species of warm-water fish. Toxicant was applied at 2.0 ppm. A complete kill was probably attained. The reservoir will be managed for rainbow trout.

## Objectives:

Crandall Reservoir is a twenty acre stockwater reservoir located about twelve miles north of Poplar, Roosevelt County, Montana. For a period of time the reservoir provided satisfactory angling for largemouth bass. In recent years angling quality had deteriorated. Test netting in July 1960 disclosed a population of various cyprinids, centrarchids, yellow perch and bullheads. The physical characteristics of the reservoir indicated that it could support a population of rainbow trout. In view of the rapid growth and the quality of angling afforded by this species in other small waters in Eastern Montana, it was decided to remove the existing population in order to establish trout in the reservoir.

## Procedures Used:

A commercial emulsifiable rotenone preparation (Pro-Nox Fish) was applied by siphoning the toxicant from a boat into the prop-wash. Water volume was computed at 170 acre feet. Since the map used was made by rather crude methods (compass and pacing), the rate of application was set somewhat high to allow for considerable error. One hundred ten gallons of toxicant were applied, giving a concentration of 2.0 ppm.

Toxicant was applied on October 11, 1960. Some difficulty in distributing the toxicant was encountered in the weedy shoal areas. An inspection made by wading these areas on October 13 disclosed numerous dead fish among the vegetation. No live fish were noted. The eradication appeared to be successful.

A tank for carrying toxicant in a small boat and dispersing the toxicant was built on this project and will be available for future projects. The apparatus consists of a frame, constructed of 2 x 4 inch lumber held together with carriage bolts. The frame rests on the front and middle seats of a 12 foot boat and is made so that it is confined by the sides of the boat and the seats. The frame is provided with a cradle into which a steel barrel is fastened in a horizontal position with a chain and a light toggle load binder. The barrel is equipped with a faucet and discharge

hose on its small bung and a short standpipe on its large bung. The apparatus greatly aided in handling the toxicant without spillage.

Results:

Observations described above suggest that a complete kill was obtained. Rainbow trout will be introduced at state expense in 1961.

This does not complete the work described in the preliminary project statement.

Prepared by Cliff Hill

Approved by George D. Holton

George D. Holton

Date December 30, 1960

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

Job Completion Report
Development Project

B1840
#8

State of Montana

Project No. F-24-D-33

Name Southeastern Montana Fishery Study

Period Covered May 1, 1960 to April 30, 1961

Title Statewide Lake and Stream Rehabilitation - Rock Island Lake

## Abstract:

Rock Island Lake was treated with 55 gallons of toxaphene in August 1960. The toxicant was aerially applied to the lake. Suckers were the principal trash fish species killed. Efforts will be made to re-establish a fish population by planting trout.

## Objectives:

Rock Island Lake is an alpine lake located in the Gallatin National Forest, accessible only by horse trail. The trail is well marked, relatively level, and is easily traveled. The fish population consisted principally of brook trout and suckers, the latter probably introduced by fishermen using them as bait. The sucker population, in addition to limiting the production of desirable fish in the lake, was a potential source of contamination of other nearby waters. Rehabilitation was carried out so the sucker population might be eliminated from the lake.

## Techniques Used:

Application of the toxicant to Rock Island Lake was made by aerial spraying. The spray nozzles were removed from the spray booms so that the toxicant was applied in small drops. To improve dispersion of the toxicant in the lake, the toxaphene was pre-emulsified with water. The toxicant was applied in relation to volume of water at a concentration of 0.01 parts per million. Areas which might be missed by aerial application, such as back bays and the outlet, were sprayed manually. The entire perimeter of the lake was checked for possible areas which might be missed by aerial application.

## Findings:

It was difficult to find suitable flying condition for aerial spraying at high elevation. Three trips were needed to apply all the toxicant. A period of ten days was needed to get in three trips. One-third of the toxicant had been applied prior to the last observation from the ground. Dead fish were observed about the shoreline and on the lake bottom in the littoral zone. Distressed fish were seen throughout the lake. The remaining toxicant was applied to the lake a week later.

Prepared by John Peters and Perry Nelson     Approved by George D. Holton

Date March 1, 1961

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

B1342
#7

Job Completion Report
Development Project

State of Montana

Project No. F-24-D-31

Name Northwestern Montana Fishery Study

Period Covered May 1, 1960 to April 30, 1961

Title Statewide Lake and Stream Rehabilitation - Lake Five

## ABSTRACT:

Lake Five, (160 acres), Halfmoon Lake (12 acres) and Mud Lake (10 acres) in Flathead County, were treated with 935 gallons of emulsifiable rotonone (Pro-Nox Fish) on September 9, 1960. This was to remove stunted populations of yellow perch (*Perca flavescens*), pumpkinseed (*Lepomis gibbosus*), as well as a small population of largemouth bass (*Micropterus salmoides*). The toxicant was applied at a rate of 1.0 ppm (1 gallon per 3 acre feet).

## OBJECTIVES:

To remove as completely as possible the existing fish populations from Lake Five, Halfmoon Lake and Mud Lake. To establish a native strain of cutthroat trout after detoxification.

## TECHNIQUES USED:

On September 9, 1960, Lake Five, Halfmoon Lake and Mud Lake were treated with 935 gallons of emulsifiable rotonone. Three boats with two-man crews were used in applying the toxicant. Application on Lake Five (160 acres) was accomplished mainly by the use of a 16-foot boat with K-B boat bailers attached to the decavatation plates of the 75 hp. motor. Prop-wash dispersed the toxicant. Application on Halfmoon Lake (12 acres) was accomplished with a 14-foot boat (10 hp.) with a siphon hose. Mud Lake (10 acres) application was accomplished by a spray and siphon system. All weed beds and shorelines were sprayed with either a power spray unit transported by boat or by back-pack fire pumps.

## FINDINGS:

Lake Five is located approximately 5 miles west of West Glacier, Flathead County, Montana. At the time of rehabilitation there were 160 surface acres, a total of 2206 acre feet of water with a maximum depth of 65 feet. To remove the existing fish populations and to prevent reoccurrence of the warm water fish species necessitated the chemical treatment of Halfmoon and Mud Lakes. Water courses connect all three bodies of water.

Shortly after application (two hours) distressed and moribund fish were observed along the shore and shallow areas of the lakes. Fish affected were mainly 2- to 4-inch pumpkinseeds, 3- to 5-inch perch, and 2- to 4-inch largemouth bass. Distribution time for toxicant application of all waters was approximately eight hours. Numerous yellow perch and pumpkinseeds accumulated in the bays but were of little public nuisance.

Post-application checks the following day revealed no fish activity in Mud Lake, and Lake Five. Distressed fish were found in Halfmoon Lake in the proximity of three spring areas within the lake. These spring areas and surroundihg waters were treated with an additional 30 gallons of toxicant. No further fish activity was found.

Detoxification tests (biological assays) were made during the next sixty days; all waters were non-toxic to fish at all depths. A native strain of cutthroat were planted at the present stocking rates into all waters treated.

Prepared by Delano A. Hanzel

Approved by George D. Holton

Date May 12, 1961

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MONTANA FISH AND GAME DEPARTMENT
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HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-24-D-30 Name Northwestern Montana Fishery Study

Period Covered May 1, 1960 to April 30, 1961 Title Statewide Lake and Stream Rehabilitation - Crystal Lake

## Abstract:

Crystal Lake (196 acres) in Lincoln County, was treated with 180 gallons of emulsifiable toxaphene on August 25, 1960. This treatment was to remove large-scale suckers (Catostomus macrochelus) and small-size pumpkinseed (Lepomis gibbosus), as well as small populations of largemouth bass (Micropterus salmoides). The toxicant was applied at a rate of 0.033 ppm (1 gallon per 60 acre feet). Recommendations are made for restocking the lake with game fish and for evaluating the success of rehabilitation and stocking as a management tool.

## Objectives:

To remove as completely as possible the existing fish populations from Crystal Lake. To establish a rainbow trout fishery after detoxification.

## Techniques Used:

On August 25, 1960, Crystal Lake was treated with 180 gallons of emulsifiable toxaphene (6 lbs. of toxaphene per gallon). Two boats with two-man crews were used in applying the toxicant. Application for the most part was accomplished with a 16-foot boat which had K-B boat bailers attached to the decavatation plates of the 75 horse power motor. Prop-wash dispersed the toxicant. Application along the shore line and weed beds was accomplished by the other boat (18 H.P. motor) with one boat bailer attached and by back-pack fire pumps.

## Findings:

Crystal Lake is located approximately 30 miles west of Libby, Lincoln County, Montana. At the time of rehabilitation there were 196 surface acres, a total of 9,783 acre feet of water, with a maximum depth of 156 feet.

The method of application used on this lake allowed this amount of water to be treated with the minimum of time and personnel. It also dispersed the toxicant in a blanket which would settle more uniformly over the entire lake.

PLEASE RETURN

Shortly after the first application of toxicant, distressed and moribund fish were observed along the shore and shallow areas of the lake. These fish were primarily small (2 to 4 inches) pumpkinseed and largemouth bass. As the application progressed, larger (6 to 14 inches) largemouth bass and pumpkinseed (6 to 8 inches) were observed.

Distribution time of the toxicant was approximately four hours. The fish of the above species were in distress and dying condition the entire day. Largescale suckers were not sighted in a distressed and dying condition until the following day. The majority of the dead suckers sank to the bottom after raising to the surface in a distressed condition. Very few suckers drifted into the bays and shore areas where they would have become a public nuisance.

Prepared by Delano A. Hanzel Approved by George D. Holton

Date March 20, 1961

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

B1B40
#5 ✓

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Name Southwestern Montana Fishery Study

Project No. F-24-D-27

Title Statewide Lake and Stream Rehabilitation - Hebgen Lake

Period Covered: April 1, 1960 - April 30, 1961

Abstract:

Hebgen Reservoir (15,000 acres) in southern Gallatin County, Montana on the Madison River was drawn down slowly for inspection and repair following the August 1959 earthquake in the area. A reservoir pool of approximately 5000 acre feet remained on completion of the drawdown in May 1960; inflow to the reservoir was 900 cfs. To reduce Utah chub (Gila atraria) numbers, the reservoir was treated with toxaphene at the rate of 0.025 ppm. The toxaphene was applied by spray plane to the lower portion of the reservoir pool and to the upper portion through drip stations located on the tributaries. Treated water that seeped through the closed control gates was toxic to fish for a distance of one-half mile below the dam. Very few fish were killed in the upper portion of the reservoir. It is possible that high turbidity in the upper portion of the reservoir pool was responsible for the rather poor results obtained.

Objectives:

To reduce the numbers of Utah chubs (Gila atraria) in Hebgen Reservoir through the use of toxicant. To take advantage of low water in the lake resulting from a drawdown for inspection and repairs at Hebgen Dam to carry out the rehabilitation. To achieve a fish kill in Hebgen Reservoir without killing fish for any appreciable distance in the Madison River below Hebgen Dam.

Findings:

Hebgen Reservoir, located in southern Gallatin County, Montana, R3, 4, and 5E, T11, 12 and 13S, is created by Hebgen Dam on the Madison River. The dam was completed in 1915 by the Montana Power Company for water storage. There has been an excellent sport fishery on the reservoir for brown trout and rainbow trout, but as the numbers of Utah chub increased, following their introduction by bait fishermen, the quality of the sport fishery declined. Richard Graham (1955) studied the Utah chub in Hebgen Reservoir and recommended partial population control through drawdown and rehabilitation.

The earthquake of August 17, 1959, centered near Hebgen Dam. To inspect the dam for any damage that might have been caused by the quake and to install new control gates, the Montana Power Company planned to draw Hebgen Reservoir down as far as possible during the winter of 1959. The planned drawdown presented an opportunity for the Montana Fish and Game Department to carry out the recommended rehabilitation.

The Montana Power Company planned to have their work completed and to start storing water again in April 1960. In view of low water temperatures expected at that date, toxaphene was selected as the fish toxicant to be used. The toxaphene would be applied from drip stations located on tributaries to the reservoir (Figure 1).

The gates at the dam were not closed until May 8, 1960. There remained in the pool above the dam approximately 5000 acre feet of water. Total inflow averaged about 900 cfs. To maintain a concentration of 0.025 ppm of toxaphene in the reservoir for a period of three days, 115 gallons of toxaphene (60%) were used.

Following closure of the gates, drip stations were installed as follows: At 2:00 p.m. on Duck Creek where water temperature was 49°F. At 2:30 p.m. on Grayling Creek, water temperature 44°F. At 3:30 p.m. on the South Fork of the Madison River, water temperature 49°F. At 4:00 p.m. on the main Madison River, water temperature 52°F. Thirty-gallon steel drums, fitted with adjustable taps, were used for the drip stations. Eight drums were used in all - one at Duck Creek, one at Grayling Creek, two on the South Fork of the Madison and four on the main Madison River. Ten gallons of toxaphene were put in each drum and the toxaphene was diluted with 20 gallons of socal No. 2 (Standard Oil Company solvent) so that the drip period could be prolonged for the desired period of time.

After an aerial inspection of the water area above the dam on May 9, 1960, and an outlining of the area to be covered, 25 gallons of toxaphene were applied to the pool area by spray plane.

All drip stations were checked several times on May 9 and were operating satisfactor Toxaphene was applied to several small spring seeps flowing into Hebgen Reservoir.

The drastic reduction in flow below Hebgen Dam when the gates were closed resulted in considerable numbers of fish being stranded in isolated pools. Some of the fish were taken by observers of the rehabilitation. Many fish were returned to the stream by the wardens. A flow of 5 or 6 cfs seeping around the gates kept the river alive until Cabin Creek and Beaver Creek entered the channel approximately 3/4 mile and 1 mile below the dam respectively. Together the two streams maintained a flow of approximately 50 cfs.

Water quality determinations on May 9 showed Hebgen Lake at the dam to have a pH of 7.6, an alkalinity of 87 ppm, and a water temperature of 54°F. Grayling Creek at 10:00 a.m. had a water temperature of 39°F, alkalinity was 46 ppm and the pH was 7.3. Water temperature in Duck Creek was 50°F. at 12:30 p.m., 54°F at 3:15 p.m., Alkalinity in Duck Creek was 46 ppm and the pH was 7.3. The South Fork of the Madison River had an alkalinity of 26 ppm, a pH of 7.3 and at 11:00 a.m. the water temperature was 48°F. Measurements on the main Madison River were very nearly identical to those at Hebgen Dam. At 10:00 a.m. the water temperature was 54°F, alkalinity was 86 ppm and the pH was 7.6.

Because the tributary streams were flowing through silt accumulations in the old lake basin and because of wind action, the upper end of Hebgen Reservoir was very turbid. The lower end of the reservoir near the dam was quite clear.

Very few dead fish were seen on the shoreline of Hebgen Reservoir; however, in the section of river channel from Hebgen Dam to Cabin Creek, large numbers of dead and dying fish were observed. Dying fish, largely trout and whitefish, exhibited typical tocicant reactions. The water in this section of the river was entirely from seepage around control gates at the dam - water that had been sprayed with toxaphene by plane on May 9.

Two to three hundred dead fish, primarily whitefish and small trout were observed in small backwater pools in the South Fork of the Madison River below the drip station. All drip stations were adjusted so that toxicant application would be completed by the afternoon of May 10.

Observations were made on succeeding days, May 11 and May 12, along the Hebgen Reservoir shoreline and along the tributaries into the reservoir; very few dead fish were seen.

By May 16 flows below Hebgen Reservoir had increased because of greater pressure on the control gates. Fish were still being affected in the section of river between Hebgen Dam and Cabin Creek; an estimated 1500 trout, dead and dying were observed in this stretch. An equal number of dead whitefish and a few dead Utah chubs were seen in the same section.

No dead fish were seen on the shores of Hebgen Reservoir on an inspection by boat on May 25.

On June 2, 1960, four 125-foot experimental gill-nets were set overnight in Hebgen Reservoir (Figure 1). At that time resort operators, John Steffler and Frank Jans reported seeing large numbers of Utah chubs in the upper end of the reservoir.

Net No. 1, Steffler Resort Area, upper end of reservoir near inlet. Net set at 4:00 p.m., June 2, lifted at 8:00 a.m., June 3., a total of 16 hours.

| Species | Number | Inches Total Length |
|---|---|---|
| Utah chubs | 175 | 6.5 to 14.0 |
| LL Trout | 3 | 17.5 to 28.9 |
| Rb Trout | 1 | 8.3 |
| Whitefish | 4 | 10.5 to 13.5 |

Net No. 2, Steffler Resort Area, upper end of reservoir. Net set at 4:30 p.m. June 2, lifted 7:30 a.m. June 3, a total of 15 hours.

| Species | Number | Inches Total Length |
|---|---|---|
| Utah chubs | 114 | 6.7 to 13.5 |
| LL Trout | 2 | 7.5 to 29.3 |
| Rb Trout | 1 | 14.3 |
| Whitefish | 3 | 12.2 to 16.0 |

Net No. 3, Howard Wells Resort Area, lower section of Hebgen Reservoir. Net set at 6:00 p.m., June 2, net lifted 10:00 a.m. June 3. A total of 16 hours.

| Species | Number | Inches Total Length |
|---|---|---|
| Utah chubs | 32 | 10.2 to 13.0 |
| LL Trout | 6 | 13.0 to 21.0 |
| Rb Trout | 10 | 10.0 to 15.0 |
| Whitefish | 7 | 10.3 to 14.5 |

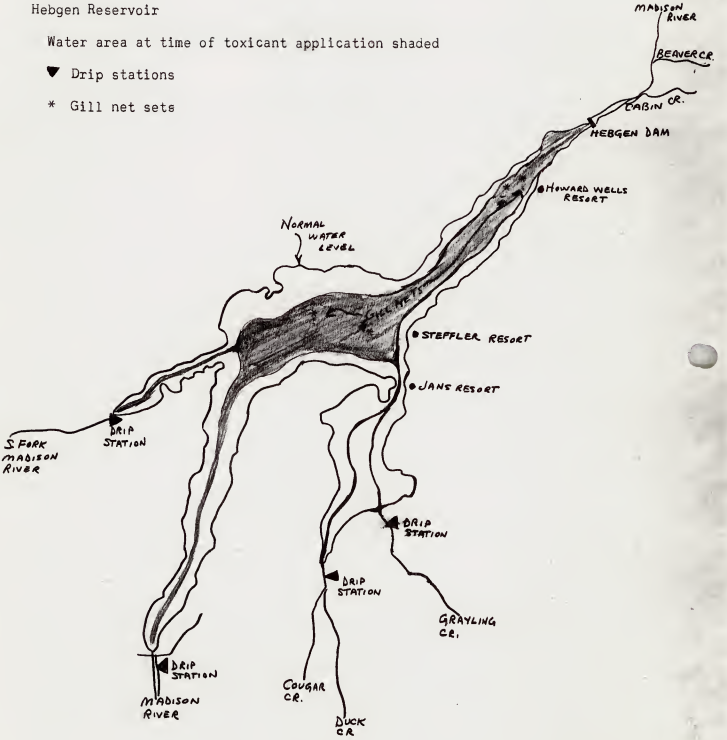
Figure 1

Hebgen Reservoir

Water area at time of toxicant application shaded

▼ Drip stations

* Gill net sets



Net No. 4, Howard Wells Resort Area, lower section of Hebgen Reservoir. Net set 6:30 p.m. June 2, net lifted 9:30 a.m. June 3. A total of 15 hours.

| Species | Number | Inches Total Length |
|---|---|---|
| Utah chubs | 2 | 11.8 to 12.0 |
| LL Trout | 7 | 11.2 to 15.0 |
| Whitefish | 21 | 9.8 to 17.0 |

Observations and gill netting showed the rehabilitation had not accomplished the desired result of reducing by any great amount, the numbers of Utah chubs in Hebgen Reservoir. Since considerable numbers of fish were killed below Hebgen Dam by the treated water that seeped around the control gates, it was assumed that the high turbidity in the upper end of the lake had reduced the effectiveness of the toxaphene.

Recommendations:

That tests be carried out to determine the effects of turbidity on the toxicity of varying concentrations of toxaphene.

Prepared by: William Alvord
June 28, 1961

Approved by: Walter J. Everin
Director, Montana Fish
and Game Department

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

B1340
#6

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-24-D-30 Name Northwestern Montana Fishery Study

Period Covered May 1, 1960 to April 30, 1961 Title Statewide Lake and Stream Rehabilitation - Crystal Lake

## Abstract:

Crystal Lake (196 acres) in Lincoln County, was treated with 180 gallons of emulsifiable toxaphene on August 25, 1960. This treatment was to remove large-scale suckers (Catostomus macrochelus) and small-size pumpkinseed (Lepomis gibbosus), as well as small populations of largemouth bass (Micropterus salmoides). The toxicant was applied at a rate of 0.033 ppm (1 gallon per 60 acre feet). Recommendations are made for restocking the lake with game fish and for evaluating the success of rehabilitation and stocking as a management tool.

## Objectives:

To remove as completely as possible the existing fish populations from Crystal Lake. To establish a rainbow trout fishery after detoxification.

## Techniques Used:

On August 25, 1960, Crystal Lake was treated with 180 gallons of emulsifiable toxaphene (6 lbs. of toxaphene per gallon). Two boats with two-man crews were used in applying the toxicant. Application for the most part was accomplished with a 16-foot boat which had K-B boat bailers attached to the decavatation plates of the 75 horse power motor. Prop-wash dispersed the toxicant. Application along the shore line and weed beds was accomplished by the other boat (18 H.P. motor) with one boat bailer attached and by back-pack fire pumps.

## Findings:

Crystal Lake is located approximately 30 miles west of Libby, Lincoln County, Montana. At the time of rehabilitation there were 196 surface acres, a total of 9,783 acre feet of water, with a maximum depth of 156 feet.

The method of application used on this lake allowed this amount of water to be treated with the minimum of time and personnel. It also dispersed the toxicant in a blanket which would settle more uniformly over the entire lake.

Shortly after the first application of toxicant, distressed and moribund fish were observed along the shore and shallow areas of the lake. These fish were primarily small (2 to 4 inches) pumpkinseed and largemouth bass. As the application progressed, larger (6 to 14 inches) largemouth bass and pumpkinseed (6 to 8 inches) were observed.

Distribution time of the toxicant was approximately four hours. The fish of the above species were in distress and dying condition the entire day. Largescale suckers were not sighted in a distressed and dying condition until the following day. The majority of the dead suckers sank to the bottom after raising to the surface in a distressed condition. Very few suckers drifted into the bays and shore areas where they would have become a public nuisance.

Prepared by Delano A. Hanzel Approved by George D. Holton

Date March 20, 1961

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

Job Completion Report
Development Project

BIB40
#4

State of Montana

Project No. F-24-D-26

Name Southeastern Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation Willow Creek Reservoir and Its Tributary (Big Horn County)

Period Covered: September 1, 1959 to April 30, 1960

## Abstract:

Willow Creek Reservoir and its tributary in Big Horn County, were treated with approximately 225 gallons of toxaphene. The toxicant was aerially applied to the Reservoir. Application to the inflowing waters was made by dripping toxaphene into the stream above the Willow Creek diversion structure. Suckers and carp were the principal species killed. Efforts will be made to establish a fishable population by plantings of rainbow trout fingerlings.

## Objectives:

This project is an attempt to control carp, suckers, pumpkinseeds, chubs, and shiners in the Reservoir and suckers in that portion of Lodge Grass Creek above the diversion dam. Four overnight experimental gill nets set in August 1957 caught by numbers 93-1/2 per cent undesirable fish; by weight 92-1/2 per cent undesirable fish. Four overnight experimental gill nets set in June 1959 caught by numbers 91 per cent undesirable fish; by weight 96 per cent undesirable fish. Approximately 90% of the fish shocked in a 300-foot section immediately upstream from the Willow Creek Diversion in Lodge Grass Creek were undesirable species.

## Techniques Used:

Willow Creek Reservoir is part of the Crow Indian Reservation Irrigation Project in Big Horn County. The dam provides irrigation water storage for nearly 23,000 acre-feet of water. The water for storage is diverted from Lodge Grass Creek by means of a two-mile diversion canal and dam. Two intermittent tributaries of Willow Creek add storage water during spring run-off.

Approximately 225 gallons of toxaphene containing 6 pounds of technical toxaphene per gallon were aerially applied to Willow Creek Reservoir. The toxicant was pre-emulsified with 75 gallons of water before application. The spray nozzles were removed on the spray booms so the toxicant was applied in drops rather than a mist. Toxaphene was applied at the rate of approximately 0.1 ppm into remaining storage water in the reservoir.

The inflowing waters were treated by dripping toxaphene into the stream above the Willow Creek diversion structure for two weeks. The intermittent tributaries were treated by pouring "slugs" of toxicant into their upper reaches.

Findings:

Distressed fish were not visually observed immediately following toxicant application. Distressed fish were observed 4 days after application. Ten days after toxicant application, all species of fish that could be visually observed were dead. Observations of dead fish windrowed along the shore indicated that carp and suckers were the most abundant species of fish in the reservoir. To date no attempt has been made to determine the completeness of kill.

Prepared by John Peters and Perry Nelson

Approved by George D Holton

Date May 6, 1960

Toxicant applied in April 1960 - see Coordination Progress Report for that month.

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

BIB 40
#3 ✓

Job Completion Report
Development Project

State of Montana

Name Northwest Montana Fishery Study

Project No. F-24-D-25

Title Statewide Lake & Stream Rehabilitation
Twin (Turtle) Lake

PERIOD: May 1, 1959 to March 30, 1960

## ABSTRACT:

Twin Lake (Turtle Lake), in Lake County was treated with 250 gallons of rotenone emulsives on September 25, 1959. This treatment was to remove populations of small perch and sunfish as well as a light population of largemouth bass. Kind and amount of toxicant used and methods of application are described. Recommendations are made for restocking the lake with game fish and for evaluating the success of chemical eradication and re-stocking as a management tool.

## OBJECTIVES:

To remove as completely as possible the existing fish population from Twin Lake (Turtle Lake). To establish a cutthroat trout fishery after detoxification.

## TECHNIQUES USED:

On September 25, 1959, Twin Lake (Turtle Lake) was treated with 250 gallons of rotenone emulsives (Pro-noxfish). Three boats with 2-man crews were used in applying the toxicant. Application was accomplished by gravity feeding the toxicant into the prop wash of the outboard. Weedy and seep areas were aprayed by a motor driven pump. Back pack fire pumps were used in inaccessible areas.

## FINDINGS:

Twin Lake is located approximately six miles east of Polson, Lake County, Montana. At the time of rehabilitation there were 44 surface acres, a total of 745 acre-feet of water with a maximum depth of 34 feet.

Shortly after the first spray application, distressed and moribund fish were observed in the shallow areas of the lake. These fish were primarily young of the year yellow perch (Perca flavescens) and sunfish (Lepomis sp.). As application progressed to the deeper waters, largemouth black bass (Micropterus salmoides) and larger specimens of the yellow perch and sunfish were observed in distress. Application time was approximately six hours. At the termination of this period suckers (Catostomus sp.) were is distress with uncountable numbers of dead or dying fish of the above mentioned species.

Back pumps were used in toxifying the inlet above the lake. Eastern brook trout (Salvelinus fontinalis)were the only species observed in the stream. No eastern brook trout were observed in the lake proper.

Periodic observations made during the month of October indicated no fish activity.

## RECOMMENDATIONS:

1. In June of 1960 cutthroat trout (Salmo clarki), Ashley Lake strain, fry should be introduced in numbers as determined from Montana's stocking table.

2. Periodic creel census coverage should be maintained, to give an estimate of catch per hour of cutthroat trout from this lake.

3. Spring observations should be made on the lake inlet during 1962-1963 to determine the extent of spawning activity and estimate the recruitment to the lake population.

## DATA AND REPORTS:

The original data and reports are in the fisheries office of the Fish and Game District Headquarters in Kalispell.

Prepared by Boyd R. Opheim

Date April 6, 1960

Approved by George D. Holton
Chief Fisheries Management
Biologist

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

Helena, Montana

Job Completion Report
Development Project

B1B40
#2 ✓

State of Montana

Project No. F-24-D-24

Name Central Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation
Lower Kolar's Reservoir

Period Covered: September 1, 1959 to April 30, 1960.

## Abstract:

On October 14, 1959 Lower Kolar's Reservoir was treated with thirty gallons of Pro-Noxfish to eradicate the existing fish population. Due to the low water temperature it was necessary to make an additional application of Fish-Tox on two following dates to insure a complete kill. A gill net was left in the reservoir from December 11 to 17, during which time no fish were caught. Efforts will be made to establish a fishable population by planting rainbow trout fingerlings.

## Objectives:

To remove or decimate as completely as possible the existing fish population in Lower Kolar's Reservoir in Judith Basin County, Montana. Fingerling rainbow trout will be planted in the spring of 1960 in an effort to establish a fishable population of trout.

## Techniques Used:

On October 14, 1959 Lower Kolar's Reservoir was treated with thirty gallons of Pro-Noxfish, a rotenone emulsive.

The emulsion was distributed from a thirty gallon drum by means of a hand pump and a hose. The emulsion was pumped over the end of the boat and mixed by action of the boat's wake and motor.

On October 16 and November 3, eight bags of Fish-Tox were added to the reservoir and on October 27 four bags were added to Arrow Creek and the canal above the reservoir. The toxicant was put into solution by dragging the bags through the water.

## Findings:

An extremely slow kill was observed following the application of Pro-Noxfish, probably due to the low water temperature (48°F). Trout began appearing three to four hours following application and small suckers and minnows shortly thereafter. Large suckers failed to show following the application of Pro-Noxfish.

On October 16, five bags of fish-Tox were added in an attempt to eradicate the larger suckers which had not previously shown up to any extent.

On October 27 Fish-Tox was added to the canal and Arrow Creek above the reservoir. Gill nets were set in the reservoir at that time and removed November 2. Three suckers were caught in the nets and presumed to have entered from the canal. Additional Fish-Tox (3 bags) was then added to the reservoir and canal on November 3.

One gill net was set December 11 and lifted December 17. No fish were caught during this period.

Suckers (Catostomus sp.) were the predominant species killed. Rainbow trout were the only game fish killed, sixteen in number. Several species of small forage fish were observed.

Fingerling rainbow trout will be planted in the reservoir during the spring of 1960 in an effort to establish a fishable population of trout.

Recommendations:

None

Data and Reports:

The original data and reports are in the fisheries office of the Fish and Game Department District Headquarters in Great Falls.

Prepared by: Eugene B. Welch

Date December 21, 1959

Approved by: George D. Holton
Assistant Coordinator

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

31B40
#1

Job Completion Report
Development Project

State of Montana

Name Northwest Montana Fishery Study

Project No. F-24-D-23

Title Statewide Lake & Stream Rehabilitation

PERIOD: May 1, 1959 to March 30, 1960

ABSTRACT:

Loon Lake, in Flathead County, was treated with 525 gallons of rotenone emulsives on September 18, 1959. This treatment was to remove pumpkinseed sunfish, and heavy populations of suckers and squawfish. Kind and amount of toxicant used and methods of application are described. Recommendations are made for restocking the lake with game fish and for evaluating the success of chemical eradication and restocking as a management tool.

OBJECTIVES:

To remove as completely as possible the existing fish population from Loon Lake. To establish a cutthroat trout fishery after detoxification.

TECHNIQUES USED:

On September 18, 1959, Loon Lake was treated with 525 gallons of rotenone emulsives (Pro-noxfish). Three boats with 2-man crews were used in applying the toxicant. Application was accomplished by gravity feeding the toxicant into the prop wash of the outboard. Weedy and seep areas were aprayed by a motor driven pump. Back pack fire pumps were used in inaccessible areas.

FINDINGS:

Loon Lake is located approximately six miles southeast of Bigfork, Lake County, Montana. At the time of rehabilitation there were 57 surface acres, a total of 1550 acre feet of water with a maximum depth of 52 feet. There is no inlet or outlet to this lake and water is supplied by underground seepage and surface run-off.

Shortly after the first spray application, distressed and moribund fish were observed in the shallow areas of the lake. These fish were primarily young of the year pumpkinseed sunfish (Lepomis gibbosus) and largemouth black bass (Micropterus salmoides). As application progressed to the deeper waters, larger specimens of the above mentioned species were observed in distress. In addition, 20 smallmouth bass (Micropterus dolomieui) were recovered. Application time was approximately 8 hours. At the termination of this period some suckers (Catostomus sp.) were is distress. Local residents reported fish in moribund condition several days after application of the toxicant. The species represented in this later distress were northern squawfish, (Ptychocheilus oergonense). Periodic observations made during the month of October indicated no fish activity.

RECOMMENDATIONS:

1. In June of 1960 cutthroat trout (Salmo clarki), Ashley Lake strain, fry should be introduced in numbers as determined from Montana's stocking table.

2. Periodic creel census coverage should be maintained, to give an estimate of catch per hour of cutthroat trout from this lake.

3. An evaluation should be made on the use of cutthroat as the management fish in this lake. Since there is little chance for natural reproduction, cutthroat should be stocked on a yearly basis for three years prior to the evaluation.

DATA AND REPORTS:

The original data and reports are in the fisheries office of the Fish and Game Headquarters in Kalispell.

Prepared by Boyd R. Opheim

Date April 6, 1960

Approved by George D. Holton
Chief Fisheries Management
Biologist

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

B1839
#16 ✓

Job Completion Report
Development Project

State of Montana

Name Central Montana Fishery Study

Project No. F-24-D-22

Title Statewide Lake and Stream Rehabilitation-Willow Creek Reservoir

Period Covered: September 1, 1959 - April 30, 1960

## ABSTRACT:

A project to eradicate rough fish from Willow Creek Reservoir and its incoming waters was started September 14, 1959 and completed October 23, 1959. Pro-Noxfish and Fish-Tox were applied by airplane and boat to incoming waters and to pot-holes which remained following drainage of the reservoir.

A maximum of 90 trout were collected from the 33,000 acre-foot reservoir on which growth data were recorded. The suckers, which formed the bulk of the rough fish, were extremely slow to react in some instances. Toxicant was distributed in the body of water (49° F) above the dam on October 1 and seven to eight hours had elapsed before suckers began to appear. Additional toxicant was added the following day due to the slow reaction. No additional suckers appeared. It is recommended that 240,000 two-to three-inch rainbow trout will be planted in Willow Creek Reservoir during the spring of 1960.

## OBJECTIVES:

To eradicate undesirable populations of suckers from Willow Creek Reservoir and as completely as possible from its connecting waters and replace with a population of rainbow trout.

## TECHNIQUES USED:

Complete drainage of the reservoir resulted in approximately ten pot-holes left standing. They ranged in size from one to sixty acres and one to ten feet in depth. A large boat was used to apply Pro-Noxfish to the large pot-hole (60 acres, 10 feet maximum depth). The toxicant-water solution was pumped into the water through two hoses on either side of the boat's bow and distributed by the boat's wake and mixing action of the motor.

Toxicant was applied to the six acre area of water above the dam by means of a hand pump and a 12-foot boat. After observing an extremely slow fish-kill three sacks of Fish-Tox were added by towing them behind the boat with a rope.

The remainder of the pot-holes were sprayed by air since the ooze prevented work with a boat.

Approximately four miles of the West and South Forks of Willow Creek were killed out with Fish-Tox. The entire Willow Creek Supply Canal and pot-holes along the canal were killed out from Diversion Dam on the Sun River to Willow Creek Reservoir. Pro-Noxfish was used in the larger pot-holes and Fish-Tox in the canal proper.

FINDINGS:

On September 21, Pro-Noxfish was applied to the largest (approximately 60 acres, Maximum depth 10 feet) and most accessible pot-hole by boat. Trout began to appear within one hour and suckers shortly thereafter. Nine rainbows and one Yellowstone cutthroat were recorded. Dead and dying suckers were extremely numerous along the shore.

Pro-Noxfish was applied to the six-acre body of water above the dam on October 1. The water temperature was 49° F., and was thought to be the main reason for the slow reaction of the fish to the toxicant. Approximately three hours had elapsed before trout were completely killed and seven to eight hours before suckers began to appear. Fish-Tox was added the following day due to the apparent light kill of suckers, however, there were no further signs of distressed fish. It was thought most of the fish in this water had previously gone out the outlet.

The stream below the dam was killed out on September 28, because it was feared suckers might get back into the reservoir when water began to overflow again. Suckers were so numerous, there appeared to be a large mortality due to suffocation.

The remainder of the pot-holes in the reservoir basin were sprayed by airplane. Seven hours of flying time were required to distribute 165 gallons of Pro-Noxfish mixed with 235 gallons of water. John Nordhagen of the Choteau Flying Service was very cooperative in this project. Only small fish were observed after the first covering of toxicant. Another application was made and numerous large fish appeared. It was virtually impossible to operate a boat in the pot-holes due to the ooze, however, a somewhat exaggerated estimate was made of the total volume contained in the pot-holes and 165 gallons of toxicant was a more than ample concentration for a complete kill.

Anderson Lake was poisoned on September 11. It is a lake of approximately 65 acres with a maximum depth of 11 feet. It was believed this lake would drain into Willow Creek with high water. Common suckers were the only species observed and were present in large numbers. The local game warden counted 52 dead fish per foot of lake shore. It is possible this lake can be made available for the public in the near future.

Frenchie Lake on the Willow Creek Supply Canal was poisoned October 2. The lake is approximately 35 acres with a maximum depth of 10 feet. There was local opinion that this lake was a good trout lake and that large trout were present. Four trout were killed and the largest was fifteen inches in length. Small suckers and minnows were numerous.

Several days were required to finish work on the remainder of the canal and connecting pot-holes. The entire length of the canal was covered with a back pump on September 23 and 29, and several small connecting pot-holes were killed. On October 5, six bags of Fish-Tox were added to the canal and a complete kill was expected down stream to the reservoir. Water had just arrived there from Diversion Dam to commence filling Willow Creek Reservoir. The following day fish were observed down to the inlet to the reservoir. Two bags of toxicant were added to the stream one-half mile up from the inlet and followed down. No additional kill was observed.

The West and South Forks of Willow Creek were killed approximately four miles up from the inlet to the reservoir on October 23. No suckers were observed. Brook trout,long nose dace and creek chubs were numerous.

## RECOMMENDATIONS:

It is recommended that 240,000 two-to three-inch rainbow trout be planted in Willow Creek Reservoir when sufficient food is available in the spring of 1960. This plant is approximately 170 fish per surface acre. Willow Creek Reservoir has an apparent low fertility and fair accessibility.

Prepared by Eugene B. Welch

Date November 6, 1959

Approved by George D. Holton
Assistant Coordinator

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

Job Completion Report
Development Project

31B39
#15

State of Montana

Project No. F-24-D-20

Name Southeastern Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation
Lost Lake

Period Covered May 1, 1959 to April 30, 1960.

## Abstract:

August, 1959, Lost Lake was treated with a mixture of 55 gallons of Pro-Noxfish poison and 3 gallons of toxaphene. The toxicant was aerially applied to the Lake. Suckers were the principal fish species killed. Efforts will be made to establish a fish population by plantings of cutthroat trout fingerlings.

## Objectives:

Lost Lake is an alpine lake located in Custer National Forest, accessible only by horse trail. The fish population consisted of brook trout and suckers; the latter probably was introduced by fishermen using them as bait. The sucker population, in addition to limiting the production of desirable fish in the lake, was a potential source of contamination of other nearby waters. Rehabilitation was carried out so the sucker population might be eliminated from the Lake Fork of Rock Creek watershed.

## Techniques Used:

Application of toxicants to Lost Lake was made by aerial spraying. The spray nozzles were removed from the spray booms so that the toxicant was applied by small drops. A mixture of 55 gallons of Pro-Noxfish, a commercial rotenone-base toxicant; 3 gallons of toxaphene; and 20 gallons of water were utilized for rehabilitation. Toxaphene was used because it remains toxic for a longer period of time than the rotenone-based toxicant. Toxaphene was expected to kill any sucker fry that might hatch later in the summer. Pro-Noxfish was applied at the rate of two (2) parts per million and toxaphene was applied at the rate of 0.05 parts per million.

## Findings:

Approximately 10 hours after application of the toxicants the fish had windrowed about the shoreline. No live fish could be observed from the shoreline the evening following application or the next morning. Almost 90 per cent of the dead fish observed from the shoreline were suckers. The lake has no surface inlet under normal summer conditions and the outlet flows less than 1/2 cubic foot per second. No live fish were observed in the outlet.

Prepared by John Peters and Perry Nelson

Approved by George D. Holton

Date May 6, 1960

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

Job Completion Report
Development Project

31839
#14

State of Montana

Project No. F-24-D-19

Name Southeastern Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation Crater Lake

Period Covered May 1, 1960 to April 30, 1961

## Abstract:

Crater Lake was treated with a mixture of 35 gallons of Chem-Fish Special and 2 gallons of toxaphene on September 7, 1960. The toxicant was applied by boat. Suckers and creek chubs were the principle species killed. When the lake is no longer toxic rainbow trout will be planted.

## Objectives:

Crater Lake is located on public land in Stillwater County. The lake is accessible via a poor jeep road following Fiddler's Creek or by walking from a county road, a distance of approximately one mile. The fish population in the lake consisted of rainbow trout; suckers; and creek chubs, the latter being very abundant. Rainbow trout planted in this lake in the past have shown very poor growth. Fish captured in gill nets in the late summer averaged lighter in weight than when planted in the spring. It is expected that the quality of the trout fishery in this lake will be greatly improved by elimination of the suckers and creek chubs.

## Techniques Used:

The toxicants were pre-emulsified with water and the mixture applied to the lake from a boat. The toxicant-water mixture was run into the propwash of the outboard motor. The amount of toxicant was dispersed into the lake with respect to depth; that is, more toxicant was applied in deep water per unit area than in shallow water per unit area. It was anticipated that the residual toxic properties of toxaphene would kill any sucker or creek chub fry which might hatch later in the fall.

## Findings:

Distressed fish were observed immediately after the toxicants were applied to the lake. No live fish were observed the following morning. Almost all of the dead

fish observed from the shoreline and observed in the littoral zone by boat were suckers or creek chubs.

Prepared by John Peters and Perry Nelson Approved by George D. Holton

Date February 23, 1961

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
Helena, Montana

Job Completion Report
Development Project

B1B39
#13 ✓

State of Montana

Project No. F-24-D-17

Name Central Montana Fishery Study

Job No. IV

Title Statewide Lake and Stream Rehabilitation, Eureka Reservoir

Period Covered: October 1, 1958 to April 30, 1959

Abstract: On October 9, 1958, Eureka Reservoir in Teton County, was treated with seventy-five gallons of rotenone emulsives. The Teton Canal Company cooperated with the Fish and Game Department by drawing the lake down to approximately two hundred and twenty-five acre feet of water. Common suckers (Catostomus sp.) were the principal species killed. Efforts will be made to establish a fishable population by plantings of rainbow trout fingerlings.

Objectives: To remove or decimate as completely as possible the existing fish population from Eureka reservoir, Teton County, Montana. As soon as the water is considered free of toxicant, efforts will be made to establish a fishable population of rainbow trout.

Techniques Used: On October 9, 1958, Eureka reservoir was treated with seventy-five gallons of rotenone emulsives.

The emulsion was pumped with a hand pump from the supply barrels to supply tanks mounted in a seventeen foot boat.

Application was accomplished by pumping water from the stern of the boat with a motor driven unit and adding toxicant into the suction side of the pump.

Findings: The Teton Canal Company assisted in the fish restoration plan by drawing the reservoir down to approximately two hundred and twenty acre feet of water.

The project documents were written in the early part of October, 1958. An attempt was made to coordinate the actual rehabilitation work and to accomplish the objectives of the documents after the probable effective date of the project. It developed that this was not possible in this instance. The lake was drawn to a low level and the toxicant applied before the effective date of the project. Waiting would have increased the cost because treatment of more water would have been necessary.

Suckers (Catostomus sp.) were the predominant species killed. Rainbow trout Salmo gairdnerii were the only game fish of consequence killed. Sculpins, Long-nosed dace and other small fish common to the drainage were observed among the dead fish.

Approximately two miles of stream and connecting canal were treated with one hundred twenty pounds of the commercial product, Fish Tox.

Efforts will be made to establish a fishable population by planting of rainbow trout fingerlings.

Recommendations: none

Data and Reports: The original data and reports are in the fisheries office of the Fish and Game District Headquarters in Great Falls.

Prepared by: Nels A. Thoreson

Approved by George D. Holton
Assistant Coordinator

Date December 15, 1959

# MONTANA STATE DEPARTMENT OF FISH AND GAME
# FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

B1839
#12 ✓

Job Completion Report
Development Project

State of Montana

Name Central Montana Fishery Study

Project No. F-24-D-16

Title Statewide Lake and Stream Rehabilitation
Sutherlin Reservoir

Period Covered: October 1, 1958 to April 30, 1959

## ABSTRACT:

On October 7, 1958, Sutherlin Reservoir in Meagher County, was treated with thirty gallons of rotenone emulsives. Because of repair work which was necessary on the fill, the reservoir had been drawn down to approximately ninety acre feet. Common suckers (Catostomus sp.) were the principal species killed. Efforts will be made to establish a fishable population by plantings of rainbow trout fingerlings.

## OBJECTIVES:

To remove or decimate as completely as possible the existing fish population from Sutherlin Reservoir, Meagher County, Montana. Because of construction work done on the fill by the Montana State WaterBoard the reservoir was drawn down to an exceptionally low level. As soon as the water is considered free of toxicant, efforts will be made to establish a fishable population of rainbow trout.

## TECHNIQUES USED:

On October 7, 1958, Sutherlin Reservoir was treated with thirty gallons of rotenone emulsives.

The emulsion was pumped with a hand pump from the supply barrels to supply tanks mounted in a seventeen foot boat.

Application was accomplished by pumping water from the stern of the boat with a motor driven unit and adding toxicant into the suction side of the pump.

## FINDINGS:

Sutherlin Reservoir was drawn to a low of approximately 100 acre feet in order to accomplish construction work on the fill.

The project documents were written in the early part of October, 1958. An attempt was made to coordinate the actual rehabilitation work and to accomplish the objectives of the documents after the probable effective date of the project. It developed that this was not possible in this instance. The lake was drawn to a low level and the toxicant applied before the effective date of the project. Waiting would have increased the cost because treatment of more water would have been necessary.

Suckers (Catostomus sp.) were the predominant species killed. Rainbow trout (Salmo gairdnerii) and Kokanee (Oncorhynchus nerka) were the game species killed. Sculpins, and other small fish common to the drainage were observed.

Efforts will be made to establish a fishable population by planting of rainbow trout fingerlings.

RECOMMENDATIONS:

None

DATA AND REPORTS:

The original data and reports are in the fisheries office of the Fish and Game District Headquarters in Great Falls.

Prepared by: Nels A. Thoreson

Date: July 28, 1959

Approved by: George D. Holton
Assistant Coordinator

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

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HELENA, MONTANA

B1839
#11

Job Completion Report
Development Project

State of Montana

Name Central Montana Fishery Study

Project No. F-24-D-15

Title Statewide Lake and Stream Rehabilitation
Deadman Basin Reservoir

Period Covered: September 15, 1958 to April 30, 1959

## ABSTRACT:

One hundred and twenty gallons of an emulsion concentrate of toxaphene containing six pounds actual technical toxaphene per gallon was applied to Deadman Basin Reservoir in Wheatland County on September 30, 1958. At time of treatment the reservoir had been drawn down to a low of approximately 23,500 acre feet. Carp and suckers were the principal fish killed. As soon as the water is determined to be non-toxic it will be planted with rainbow trout.

## OBJECTIVES:

To remove or decimate as completely as possible the existing fish population from Deadman Basin Reservoir and the supply canal to it from the Musselshell River. The reservoir and supply canal are located in Wheatland County, Montana. Because of construction work done on the fill, the reservoir was drawn down to an exceptionally low level. As soon as the water is considered free of toxicant it will be planted with rainbow trout.

## TECHNIQUES USED:

During the last of September and the first of October, 1958, Deadman Basin Reservoir was treated with 120 gallons of an emulsion concentrate of toxaphene containing six pounds actual toxaphene per gallon.

The emulsion was pumped with a hand pump from the supply barrels to supply tanks mounted in a seventeen-foot boat.

Application was accomplished by pumping water from the stern of the boat with a motor driven unit and adding toxicant through an accurately controlled valve on the suction side of the pump. From the pump the mixture was delivered below the water surface on both sides of the box of the boat.

Five small reservoirs along the supply canal were treated by dragging sacks of a commercial fish toxicant behind a small boat and by use of fire fighting type back pumps.

## FINDINGS:

The Deadman Basin Reservoir has contained in excess of 35,000 acre feet normally, however, in 1958 it was drawn down to a low of slightly more than 23,500 acre feet. With the new construction on the fill it will be possible to impound in excess of 75,000 acre feet.

Because of the relatively small amount of toxicant (1/100 of 1 ppm.) to be applied to the reservoir, a system had to be devised to prevent the toxicant from being pumped too rapidly. A drip type valve on a by-pass circuit was incorporated into the pumping system which made possible a very precisely controlled system. The material was applied into a flow of approximately 25 gallons per minute and pumped into the reservoir over a period of fourteen hours continuous operation.

Carp (Cyprinus carpio) and suckers (Catostomus sp.) were the predominant fish killed in the reservoir. Rainbow trout (Salmo gairdneri)and Kokanee (Oncorhynchus nerka) were observed in small numbers. Other fish killed included dace (Rhinchthys sp.) and several species of minnows common to the area.

The application of toxicant in the reservoir and supply canal was accomplished during September and October 1958.

Several gill net sets,made over prolonged periods since toxicant application, have caught no fish.

Checks will be made of toxicity in the reservoir and when suitable for planting, rainbow trout fingerlings will be planted at state expense.

## RECOMMENDATIONS:

It is recommended that a follow-up investigational study be made to determine the success of establishing a fishable population by planting rainbow fingerlings.

## DATA AND REPORTS:

The original data and reports are in the fisheries office of the Fish and Game district headquarters in Great Falls.

Prepared by Nels A. Thoreson

Date July 21, 1959

Approved by George D. Holton
Assistant Coordinator

MONTANA DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

JOB COMPLETION REPORT
DEVELOPMENTS AND OPERATIONS

B1339 /
#10

State of Montana

Project No. F-24-D-14 Name Southeast Montana Fishery Study

Job No. I Title Statewide Lake and Stream Rehabilitation; Cooney Reservoir and tributaries.

Period Covered September 1, 1958-April 30, 1959

## Abstract:

Cooney Reservoir and portions of streams tributary to this reservoir were chemically treated in 1958 in order to eradicate the carp population of the reservoir and to reduce populations of other undesirable fish in the drainage. Toxaphene was applied to the reservoir at the rate of 0.1 ppm. Storage at the time of treatment was about 9000 acre feet. The tributary streams were treated with a combination of toxaphene and liquid rotenone-based toxicants.

Rainbow trout will be reintroduced when the water loses its toxicity.

## Objectives:

Cooney Reservoir is an irrigation storage reservoir built about twenty years ago by the Montana State Water Conservation Board. Much of the storage water is unsold, resulting in a relatively stable water level. The quality of the fishery in this reservoir has deteriorated in recent years. Netting indicated that suckers and carp made up a large part of the fish population. Bluegills were also present in the reservoir; dace and chubs were abundant in certain portions of the tributary streams. While carp, bass and bluegills were restricted to the reservoir and to a few small backwaters immediately above, the suckers ranged extensively in the tributaries. Western white and longnosed suckers were found to a line generally slightly below the highway between Red Lodge and Roscoe, while mountain suckers ranged considerably higher into the foothills of the Beartooth Mountains. Irrigation canals originating in adjacent drainages and spilling into various ditches and tributaries in the Cooney Reservoir drainage constitute potential sources of recontamination with suckers.

Rehabilitation was undertaken with the intention of eliminating carp in the drainage and reducing common sucker and other cyprinid populations as severely as possible. It was not considered practical or necessary to treat the portions of the tributaries inhabited only by trout and Jordan suckers.

## Procedures Used:

The reservoir has a maximum surface area of 862 acres and a storage capacity of 27,000 acre feet. Normal residual storage at the completion of the irrigation season is about 10,000 acre feet. At the time that this project was planned, the State Water Board indicated an intention to cooperate by lowering the water to 5000 acre feet or less in 1958. Later, the board decided not to lower the water below the usual level. Because of this change in conditions, the project was amended to utilize a less expensive toxicant, toxaphene, in the reservoir rather than rotenone-based material as had been originally planned. A brief study of the effectiveness of toxaphene in running water was made in one of the tributaries. Because of the inconclusive results and the threat of oncoming freezing weather, a rotenone-based toxicant was used in the tributaries in addition to toxaphene. On October 27 the reservoir was treated with 300 gallons of Stauffer Chemical Company's "Toxaphene 6-E" containing six pounds of technical toxaphene per gallon. The manufacturer's analysis of this material is as follows: toxaphene (technical chlorinated camphene containing 67-69% chlorine): 59.89%; solvent: 35%;inert material: 5.2%. The reservoir contained approximately 9000 acre feet of water, resulting in a concentration of approximately 0.073 ppm of technical toxaphene. Two boats were used. The toxicant was applied without previous dilution by a combination of gravity flow and suction caused by the motion of the distribution tube through the water. On one boat, the distribution tube was taped to the outboard motor with the end of the tube behind and slightly above the propeller. On the other boat the distribution tube was connected to a drain hole in the bottom of the boat just forward of the transom. A favorable wind aided in distributing the toxicant into the shoal areas of the inlet deltas.

Toxaphene was distributed at intervals of about five airline miles along the two principal tributaries (Willow Creek and Red Lodge Creek) on the day previous to application to the reservoir. In addition, both toxaphene and Chem-fish Special had been applied at various points in the drainage over a period of several weeks in the course of checking distribution of fish and in testing toxicants.

On October 28 and 29 Pro-nox Fish was applied to backwaters and slow side channels in the streams of the drainage with pack pumps. On October 30 toxicant was applied in 'slugs' on the streams. Fifty gallons of "Toxaphene 6-E" and 80 gallons of Pro-nox Fish were used. Toxaphene and Pro-nox Fish was applied in 'slugs' along Willow Creek and Red Lodge Creek on three occasions during the first half of November in order to maintain toxicity in the inlets of the reservoir.

## Results:

Large numbers of dead and distressed suckers were found windrowed along the shoreline of the reservoir on October 28 and 29. On the latter date many distressed carp and some dead carp were observed. Few trout were observed along the shore. No activity by fish was noted one week after application of toxicant. The fish kill resulting from this treatment occurred more rapidly than has been observed in most other cases where toxaphene has been used. The application rate used in Cooney Reservoir, however, was considerably higher than is usually used for fish population control. This high concentration was chosen because of the rapid transfer of water in the reservoir; the two principal tributaries had a combined flow of nearly 100 cfs. and the outlet flow was similar. It was felt that it was necessary to accomplish a complete kill quickly before the areas around the inlets became detoxified.

Four 125-foot experimental gill nets were set in March, 1958, in the reservoir. These nets were checked at the end of one week and were lifted at the end of two weeks. No fish were captured. Three cages containing rainbow trout were placed in the reservoir on April 8, 1959. All fish were dead on the first subsequent observation on April 15. It is probable that water exchange and dilution will result in loss of toxicity after runoff has occurred in the higher portions of the drainage. Further testing will be done at that time.

Prepared by Cliff Hill

Date May 1, 1959

Approved by George D. Holton
George D. Holton

JOB COMPLETION REPORT

DEVELOPMENTAL PROJECT

B1839
#9
/

STATE OF Montana

PROJECT NO. F-24-D-13 NAME Statewide Lake and Stream Rehabilitation

JOB NO. 1 TITLE Upper Clearwater Drainage

PERIOD COVERED September 1, 1958 through December 1, 1958

ABSTRACT: The Upper Clearwater Drainage was treated with fish toxicants between September 10 and November 11, 1958. Fish-tox, Pro-noxfish, Chem Fish Synergized Special and Toxaphene were used in the various waters of this subdrainage. Kinds and amounts of toxicants used and methods and schedules of application are described. The fish species present in the treated waters of the drainage are listed. Recommendations are made for re-stocking the area with game fish, for evaluating the success of this rehabilitation project, and for future rehabilitation work in the remainder of the Clearwater drainage.

TECHNIQUES USED: Treatment of the upper Clearwater drainage with toxicants began on September 10 and ended on November 11, 1958. The main portion of the job was accomplished between September 10 and 13. The locations of the waters in this drainage section are shown on Figure 1.

Clearwater Lake was treated with 7,720 pounds of Fish-tox on September 10, 1958. Because this lake is inaccessible by road, the toxicant was applied by aircraft. On September 9, two crew members packed into Clearwater Lake, where they observed the aerial application on the 10th and treated the North Fork of the Clearwater River at two points with two 12-pound applications of Fish-tox. (Stations 1 and 3, Figure 1.)

Through cooperation with the U. S. Forest Service, Fish-tox powder was mixed with water to the consistency of thin paste and pumped aboard the spray planes at their smokejumper's base, west of Missoula. The Forest Service loaned the use of their borate mixer, three centrifugal pumps and three men for this operation on September 10th.

Spray planes converted from Navy torpedo bombers (TBM's), which were normally used to apply borate to forest fires, were employed to transport and apply the toxicant. Each of these aircraft was equipped with a three-compartment, 600 gallon tank. Each of the three compartments had a separate dump chute and the pilot, by pulling a series of levers, could dump each tank separately, or all three tanks at once. Prior to this rehabilitation job, an experimental water dump was made at the airport, west of Missoula. When all three tanks were dumped at once, with the aircraft flying 190 m.p.h. about 300 feet above the ground, coverage of approximately 2000 feet by 200 feet was obtained. Thus, by dumping his tanks in sequence, rather than simultaneously, the pilot could extend his swath the maximum distance across the lake (approximately 3,500 feet).

Eight loads of toxicant were applied to Clearwater Lake between 0620 and 1235 hours on September 10th. The application pattern is shown on Figure 2.

The treatment of Summit Lake and its backwater areas began on September 11th. Four hundred and sixty pounds of Fish-tox were applied to the surface of the lake and 640 pounds were used for the treatment of the backwater areas, both above and below the lake. The lake was treated by towing sacks of toxicant behind an outboard powered boat. Toxicant was applied to the backwater areas by sacks and back pumps. Summit Lake and its shoreline were completely treated on September 11th. The backwater areas were completed to the inlet of Rainy Lake on September 12th.

On September 12th, 425 gallons of emulsifiable liquid rotenone were applied to Rainy Lake. One 55 gallon drum of Pro-noxfish regular, plus 40 gallons of Chem Fish Synergized Special were sprayed on the shoreline and weedbed areas through a high-pressure, Pacific Marine pump. Six 55 gallon drums of Chem Fish Synergized Special were applied to the lake's surface. This application was made by attaching a length of one-quarter inch pipe to the small bung of the toxicant barrel and trailing the terminal end of the pipe in the prop wash of the outboard motor. The barrel was mounted at sufficient elevation in the boat to permit gravity flow of the toxicant through the outlet pipe. A valve installed in this pipe permitted regulation of the amount of toxicant flow. Because no outboard foot valve and hose arrangement was used to pre-mix the toxicant and water by this method, the distribution boat could travel at full throttle, and cover its area in a series of "criss-cross" patterns. Although the "track" of toxicant immediately behind the boat was somewhat narrower by this method than it was behind a 30 foot boom spray, better apparent distribution was obtained by the gravity flow method. This was due to the fact that the higher speed allowed by the absence of an outboard intake pipe permitted more thorough coverage of an area in a given length of time. This higher speed also allowed the boat operator to locate his previous "track" more readily, when attempting to lay down a definite pattern.

During the treatment of Rainy Lake, 20 pounds of Fish-tox were applied to the North and South Forks of the Clearwater River at stations 8 and 9, Figure 1. This toxified the stream from the junction of its forks to Rainy Lake.

On September 13th, 80 pounds of Fish-tox and two gallons of Chem Fish Synergized Special were applied to the North Fork of the Clearwater River at stations 1 through 8.

Rainy and Summit Lakes were sampled with gill nets on October 23, 1958. Two dolly varden trout were taken in Rainy Lake and one coarse-scaled sucker was taken in Summit Lake.

On November 11th, seven gallons of 60% toxaphene were applied to the surface of Summit Lake. The toxicant was mixed 1:30 with water before it was applied. Distribution was made with the use of one boat equipped with the gravity flow toxicant dispenser, described above.

A list of the waters treated, lake areas and volumes, stream lengths and estimated flows, and amounts of toxicant applied are shown in Table 1.

FINDINGS: Fish species known to be present in the various waters of this drainage section are shown in Table 2.

Shortly after the first load of toxicant had been distributed on Clearwater Lake the ground crew observed fish in distress. After the last load had been applied, distressed and moribund fish could be seen over the entire surface of the lake. These were primarily mountain whitefish and longnose suckers.

On September 21, 1958 partially decomposed fish were observed along the shores of Clearwater Lake, and no fish activity was noted. This lake has not been test netted since its treatment.

Yellow perch were noted in distress within one-half hour after the first sacks of toxicant were applied to Summit Lake. This species, longnose suckers and redside shiners could be seen distressed and moribund throughout the entire treatment of the lake. These same species were also killed, along with a surprisingly large number of small cutthroat trout, in some of the very shallow, weedy backwater areas.

The one longnose sucker taken from Summit Lake in a gill net on October 23rd indicated lack of toxicity in the lake itself. Even if this fish had been missed in some backwater area, it should have died upon entering the lake, due to the normally long-lasting toxicity of Fish-tox. (The manufacturers specifications indicated that the original 1 p.p.m. Fish-tox application should have resulted in a concentration of 0.07 p.p.m. of toxaphene in the lake). On the assumption that the dense beds of Myriophyllum, which cover the bottom of Summit Lake, might have removed some of the toxaphene from the first application, the lake was re-treated; this time with 0.1 p.p.m. toxaphene by weight. No fish were observed during this second treatment on November 11th.

All of the species of fish listed for Rainy Lake, on Table 2, were observed during and after the treatment of this body of water on September 12th. On September 14th, some fish were still appearing in distress; on September 16th, no further fish activity could be noted.

On September 16th, several schools of small perch, not obviously in any distress, were observed in the shallow, upper end of Alva Lake, which is on the Clearwater River about one mile downstream from Rainy Lake. No dead fish could be found in this area, except in the immediate vicinity of the river's mouth, where two longnose suckers had lodged on a sandbar. Thus, it is believed that toxic water from the rehabilitated area had no noticeable effect on the fish populations in the lakes downstream.

When the main Clearwater River, from its forks to Rainy Lake, was toxified on September 12th, it was noted that live fish were present in the North Fork at station No. 8. On September 13th, the North Fork was checked for its entire length and found to have sunk underground at several places in the vicinity of station No. 2. The stream was re-treated with toxicant at stations 1 through 8 on the same day. Only cutthroat trout were observed to have been killed by this treatment.

The two dolly varden trout taken by gill nets in Rainy Lake on October 23rd were to have been expected. This species, cutthroat trout and mountain whitefish were left in the untreated portion of the South Fork of the Clearwater River. Their presence in the lake at that time was a good indication that toxicity from the straight rotenone toxicants used in Rainy Lake had already dissipated.

Table 1. Amount and kind of toxicants applied to the various waters in the upper Clearwater drainage.

| Body of Water | Acres or miles | Acre feet or c.f.s. | Toxicant applied |
|---|---|---|---|
| Clearwater Lake | 127 acres | 2,792 a.f. | 7,720 lbs. Fish-tox |
| Summit Lake | 27 acres | 136 a.f. | 440 lbs. Fish-tox and<br>7 gal. toxaphene |
| Rainy Lake | 70 acres | 1,188 a.f. | 425 gal. emuls. rotenone |
| Bertha Cr., Sucker Cr. & backwater areas | 4 miles | 3 a.f.(est.) | 640 lbs. Fish-tox |
| Main Clearwater River,<br>N.F. Clearwater River | 1 mile<br>4 miles | 20 c.f.s.<br>5 c.f.s. | 100 lbs. Fish-tox and<br>2 gal. emuls. rotenone |

Table 2. Fish species known to be present in waters rehabilitated in the Upper Clearwater project. Relative abundance of species in decending order, for each body of water.

| Body of Water | Fish Species |
|---|---|
| Clearwater Lake | Longnose sucker<br>Mountain whitefish<br>Cutthroat trout |
| Summit Lake | Yellow perch<br>Longnose sucker<br>Redside shiner |
| Bertha Cr., Sucker Cr. and backwater areas | Yellow perch<br>Longnose sucker<br>Redside shiner<br>Cutthroat trout |
| Rainy Lake | Mountain whitefish<br>Longnose sucker<br>Largescale sucker<br>Yellow perch<br>Peamouth chub<br>Redside shiner<br>Northern squawfish<br>Cutthroat trout<br>Dolly varden trout |
| Clearwater River and N. F. Clearwater River | Cutthroat trout<br>Mountain whitefish<br>Dolly varden trout<br>Longnose sucker |

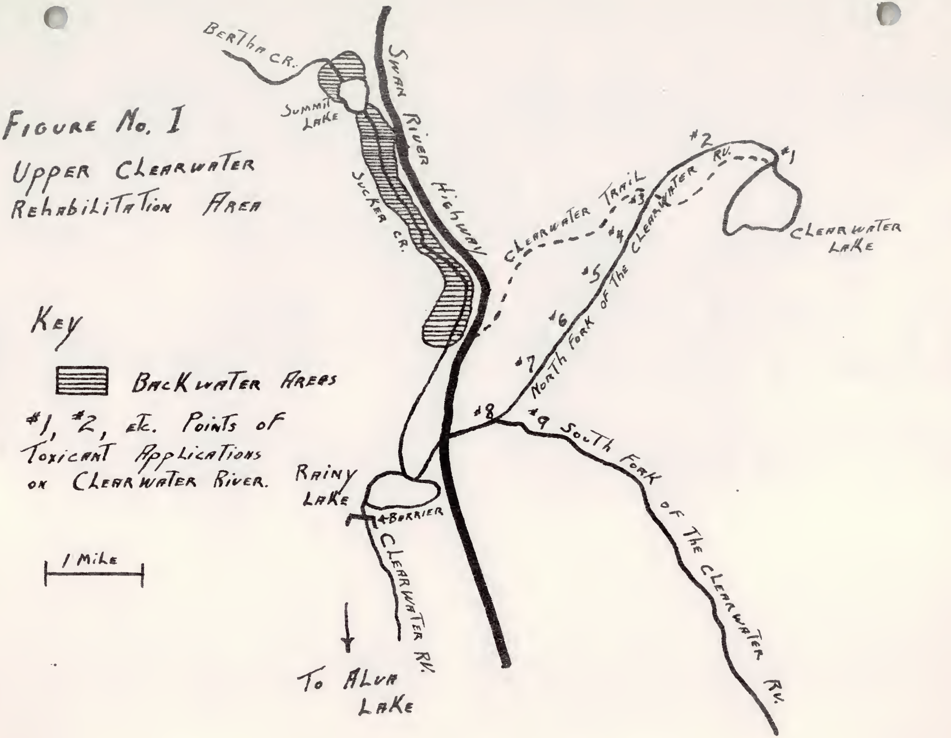

Figure No. I
Upper Clearwater Rehabilitation Area

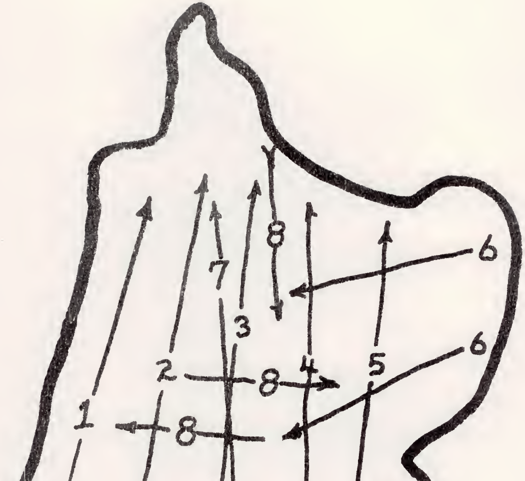

Figure #2
Toxicant application pattern of Clearwater Lake

Following is a list of common and scientific names of fishes mentioned in this report:

Cutthroat trout, (*Salmo clarki*)
Dolly varden trout, (*Salvelinus alpinus malma*)
Mountain whitefish, (*Prosopium williamsoni*)
Longnose sucker, (*Catostomus catostomus subsp.*)
Largescale sucker, (*Catostomus macrocheilus*)
Peamouth chub, (*Mylocheilus caurinum*)
Redside shiner, (*Gila balteatus*)
Northern squawfish, (*Ptychocheilus oregonense*)
Yellow perch, (*Perca flavescens*)

RECOMMENDATIONS:

1. From our previous experience with lakes treated with Fish-tox and/or toxaphene, Clearwater and Summit Lakes are expected to remain toxic for at least two seasons. It is recommended that they be checked for toxicity in the spring or summer of 1960.
2. Although only a small portion of the flow through Rainy Lake comes from Clearwater and Summit Lakes, Rainy should be checked for toxicity, using live cages of trout, following the major portion of the spring runoff in 1959.
3. If Rainy Lake is not toxic, it should be planted, in 1959, with the west-slope variety of cutthroat trout. Size and number should be determined from Montana's stocking tables.
4. When the waters of Summit and Clearwater Lakes have lost their toxicity, these lakes should also be planted as in No. 3 above.
5. Continued stocking of the drainage with trout should be based upon the recommendations of the fishery personnel responsible for the management of the drainage.
6. Creel census coverage of sufficient intensity to give a good estimate of catch per hour of game fish, should be given to Rainy, Alva and Inez Lakes in 1960, 1961 and 1962.
7. Rehabilitation of any large, major portion of the Clearwater drainage should depend upon a careful evaluation of the cost of whatever improvment in fishing is produced in Rainy Lake.
8. An engineering survey should be made of the entire Clearwater drainage to determine other suitable locations for barrier dams.
9. If a suitable barrier site can be located to separate another small, easily workable portion of this drainage, then that portion should be blocked off and rehabilitated. This should not depend upon the evaluation recommended in Nos. 6 and 7 above, but should be used, along with Rainy Lake, for that evaluation.

PREPARED BY Arthur N. Whitney APPROVED BY George D. Holton

DATE March 31, 1959

MONTANA DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

JOB COMPLETION REPORT
DEVELOPMENT AND OPERATIONS

B1839
#8

State of Montana

Project No. F-24-D-12

Name Statewide Lake and Stream Rehabilitation - Park Lake

Period Covered May 1, 1958 to April 30, 1959

## Work Accomplished:

Park Lake is located in Jefferson County about 20 road miles southwest of Helena. This lake was purchased with Federal Aid funds in 1958. For supporting documents, maps and photos refer to P.S.&E. of project F-22-L-2.

Canals and Channels: Park Lake is a natural lake the level of which was raised by dyke and dam to supply water for a mining operation about 1888. A one and one-half mile long water supply ditch runs from a diversion dam on Lump Gulch Creek to the lake. Plans call for raising the lake level (about 6 feet) to the former level by putting the ditch back into operation. This would increase production and alleviate possible winter kills.

About three weeks were spent clearing obstructions (rock slides) in the ditch, particularly at the outlet and inlet. Tests revealed leaks and overflows and these were repaired. On September 11, 1958 water was delivered to the lake for about 24 hours and no leaks were observed.

Continuous flows for several weeks might develop more leaks or breaks and a more permanent ditch lining may be necessary for certain areas of the canal. The benefits derived from extensive repairs and maintenance may not compensate for the cost. Periodic winter kills may prove a boon to management.

## Population Control:

A hydrographic map of the lake was constructed on July 16, 1958. The lake had a surface area of 33 acres and a volume of about 307 acre feet. The maximum depth was 30 feet and the mean was 9.3.

On September 12, 1958 the lake was treated with 110 gallons of Pro-Noxfish. The concentration used was approximately 1.2 ppm. Application in the open water area was made with a venturi pump. The shore line was sprayed with power and hand pumps.

The only dead fish observed several hours following treatement was the common sucker. This was also the only species taken by gill nets prior to treatment. Two overnight gill net sets were made on September 26, 1958 and no fish were taken.

Recommendations:

The ditch should be put into operation as soon as possible in the spring. Regular checks should be made to observe any leaks or breaks in the ditch. Toxicity tests should be made as soon as possible. It is recommended that 15,000 fry or fingerling rainbow trout be stocked when the water becomes non-toxic.

Prepared by Richard J. Graham

Approved by George D. Holton

George D. Holton

Date April 29, 1959

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

B1B39
#7

Job Completion Report
Development Project

State of Montana

Name Central Montana Fishery Study

Project No. F-24-D-11

Title Statewide Lake and Stream Rehabilitation Ackley Lake and Judith River

Period Covered: September 15, 1958 to April 30, 1959

## ABSTRACT:

Ackley Lake in Judith Basin County was treated with 825 gallons of rotenone emulsives on October 14, 1958 to remove rough fish,principally common suckers (Catostomus sp.)

Following treatment of the lake the Judith River upstream from the Ackley Lake supply canal was treated with the commercial toxicant, Fish Tox.

Gill nets set in lake for a prolonged period following toxicant application failed to catch any fish.

Efforts will be made to establish a fishable population by plantings of rainbow trout fingerlings.

## OBJECTIVES:

To remove or decimate as completely as possible the existing fish population from Ackley Lake and a portion of the Judith River along with the Ackley Lake supply canal above the lake. To establish a rainbow trout fishery after chemical treatment is a further objective of this project.

## TECHNIQUES USED:

On October 14, 1958, Ackley Lake was treated with 620 gallons of Pro-Noxfish and 205 gallons of Chem Fish Special for a total of 825 gallons of Rotenone emulsives.

The material was pumped with a hand pump from the supply barrels to supply tanks mounted in a seventeen foot boat.

Application was accomplished by pumping water from the stern of the boat with a motor diven unit and adding toxicant into the suction side of the pump.

From October 28 to November 14, 1958 the commercial product, Fish Tox, was used in rehabilitation of the inlet canal and the Judith River upstream from Ackley Lake. Cold weather and ice formation stopped the work in mid November. The work was resumed in March, 1959 and has been continued to the present date.

Beaver dams aided in the application of the toxicant in the river since low flows hampered the movement of the material downstream. Beaver impoundments were treated with the toxicant and then the dam opened with explosives which resulted in a surge of toxic water downstream flowing into backwaters and isolated small pockets of water along the stream channel.

FINDINGS:

Ackley Lake was drawn down to 2,475 acre feet for the purpose of rehabilitation. It was originally proposed to draw it down to 1,685 acre feet but physical limitations of the outlet works prevented this.

Suckers (Catostomus sp.) were the predominant species killed in both the lake and treated portion of the stream. Rainbow trout (Salmo gairdnerii) and Kokanee (Oncorhynchus nerka) were observed in small numbers in the lake while Rainbow, Eastern Brook Trout (Salvelinus fontinalis) and Brown Trout (Salmo trutta fario) were found in the stream along with several species of minnows common to the area.

Several gill net sets made over prolonged periods since toxicant application have caught no fish.

Efforts will be made to establish a fishable population by plantings of rainbow trout fingerlings.

RECOMMENDATIONS:

It is recommended that further treatment of the river downstream from the Ackley Lake diversion be accomplished.

DATA AND REPORTS:

The original data and reports are in the fisheries office of the Fish and Game District Headquarters in Great Falls.

Prepared by Nels A.Thoreson

Date July 28, 1959

Approved by George D. Holton
Assistant Coordinator

31839
#6 ✓

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

Job Completion Report
Development Project

State of Montana

Project No. F-24-D-10 Name Central Montana Fishery Study

Job No. I Title Statewide Lake and Stream Rehabilitation Kolar Reservoirs

Period Covered: August 1957 to April 1958

Abstract: Six hundred pounds of a fish toxicant commercially known as Fish Tox and fifty-five gallons of Pro-Noxfish was applied to Kolar Reservoir No. 1, several miles of McCarthy Creek and associated ponds and sloughs. White suckers were the predominant species of fish killed. Checks were made following treatment. No fish have as yet been found. Rainbow trout fry will be planted in May, 1958.

Objectives: To remove the existing fish population from Kolar Reservoirs and associated waters located near Geyser in Judith Basin County so it can be restocked with rainbow trout.

Techniques Used: Experimental gill nets were used to sample the reservoirs. Limited use of toxicants were used in the associated waters.

Treatment of the stream was accomplished by dragging sacks of the commercial product Fish Tox downstream. The main reservoir and several associated ponds and sloughs were treated with a liquid toxicant known commercially as Pro-Noxfish. It was applied by use of a spray boom mounted on the boat and by a hose submerged in the deeper portions of the reservoir.

In the flowing waters:streams, spring holes, etc. and ponds with springs arising from the bottom 600 pounds of Fish Tox was used. In the impounded water fifty-five gallons of Pro-Noxfish was used at a rate of one part per million.

Findings: The original plans included fish removal from two reservoirs, Kolar Reservoir No. 1 and Kolar Reservoir No. 2. Because a reservoir washed out in the Arrow Creek drainage downstream from Kolar's Reservoir No. 2 removing an effective fish barrier the plans for rehabilitation of the No. 2 reservoir were discontinued.

The reservoir treated (Kolar Reservoir No. 1) covers approximately 11 acres and contains approximately 100-acre feet. A reservoir owned by the Great Northern Railway Co. upstream from the main reservoir containing approximately 7-acre feet and several other ponds and sloughs were also treated. The fish were killed out from approximately three miles of McCarthy Creek associated with the reservoirs and sloughs.

White suckers (Catostomus commersonnii) were the predominant fish killed in the reservoir. Less than fifty trout were observed in all of the rehabilitation most of which were killed in the reservoir. White suckers were also found in the stream and associated ponds and sloughs. Other fish killed were dace (Rhinichthys sp.), mountain suckers (Pantosteus sp.) and several species of minnows common to the area.

The application of toxicant was started on August 26, 1957 and completed on September 17, 1957.

Checks made in the stream sections following toxicant application and in the spring of 1958 have disclosed no fish present.

One gill net was set through the ice in Kolar Reservoir on December 4, 1957 and lifted January 9, 1958. Nothing was caught. A second net set on December 4, 1957 and lifted April 23, 1958 caught only crayfish.

Rainbow trout fry will be planted in the reservoir and stream during May 1958 at state expense.

Recommendations: It is recommended that a follow-up investigational study be made on the rehabilitated waters in order to determine the success of establishing a fishable population by planting rainbow fry.

Data and Reports: The original data and reports are in the fisheries office of the district headquarters in Great Falls.

Prepared by Nels A. Thoreson

Approved by George D. Holton

Date May 9, 1958

BIB3
#5 ✓

# JOB COMPLETION REPORT

## INVESTIGATIONS PROJECTS

State of Montana

Project No. F-24-D-9

Job. No. I

Name Western Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation - Bull Creek Drainage

Period Covered October 1, 1957 through October 15, 1957

Abstract: The Bull Creek drainage, above Kleinschmidt Lake, was rehabilitated in early October, 1957. The project included the following lakes: Big Tupper, Little Tupper, Deadmans and Browns. Bull Creek, tributary stream to Browns Lake, was also rehabilitated.

Treatment of the drainage was completed downstream to an earthen dam between Browns and Kleinschmidt Lakes. A total of 2063 gallons of toxicant was applied to the drainage in an effort to eradicate yellow perch, walleye pike and suckers.

Tables showing toxicant amounts and fish species for each body of water in the drainage are given.

Objectives: The objectives of this job were to remove the yellow perch, suckers and walleye pike from the Bull Creek drainage so it can be restocked with rainbow trout.

Techniques Used: The Bull Creek drainage, located approximately 70 miles east of Missoula, was rehabilitated in October, 1957. A total of 38 fifty-five gallon drums of Pro-Noxfish and Chem Fish Regular toxicant was applied to the waters in the drainage. Table 1 lists the waters treated, along with their characteristics and amount of toxicant applied.

Browns Lake, largest of the lakes in the drainage, was marked off into five sections. Water volumes and toxicant amounts for each section were computed. Deadmans, Big Tupper and Little Tupper Lakes were of such small size that it was unnecessary to section them.

Toxicant dispersion for the lakes was accomplished by use of three spray booms and one high pressure nozzle spray, mounted on outboard motor boats. Two shoreline areas of Browns Lake were too weedy for land application of the toxicant so were sprayed from an airplane.

Back pumps were employed to toxify the "pothole" areas near Browns Lake. Bull Creek was also toxified by use of back pumps.

Toxicant was mixed with lake water, at the rate of 1:10, while it was being applied. Toxicant was applied at the rate--1 part per million parts of water.

Findings: The rehabilitation of the Bull Creek drainage began on October 5, 1957. Big Tupper, Little Tupper and Deadmans Lakes were all toxified on the above date, and at the same time interval. On October 7, 1957, Browns Lake was toxified. Due to adverse flying weather, completion of the Browns Lake rehabilitation was not achieved until October 10, when aerial application of the toxicant became possible.

Seven fish species were found in the Bull Creek drainage. Table 2 lists the waters in the drainage and the fish species present.

Up to this date, no attempt has been made to check the completeness of the fish kill in the Bull Creek drainage.

Because of the advent of cold weather, the treatment of the Bull Creek drainage was stopped at an earthen dam between Browns and Kleinschmidt Lakes. Due to adverse weather conditions at the time of treatment, a larger crew was required than was originally planned for. Because of this, the total expenditure of the project so far has already exceeded the amount budgeted, while the job is still not completed.

Recommendations:

1. In order to prevent reinfestation of rough fish, the remainder of the drainage (primarily Kleinschmidt Lake) must be rehabilitated in 1958. A project amendment should be prepared for the continuation of this project, with the addition of sufficient funds to complete the job.

2. Browns Lake should be checked for possible fish survival in the spring of 1958.

3. Browns Lake should be planted with spring run rainbow trout fry (500/lb. or larger) in the spring of 1958, 1959, 1960 and thereafter, as the need arises. All other lakes in the drainage, capable of holding trout, should be planted on a similar basis. Bull Creek should be restocked with native west slope cutthroat trout.

4. Continued stocking of the drainage with trout should be based upon investigation and recommendation of the fishery personnel responsible for the drainage.

Prepared by R. C. Averett

Date April 28, 1958 Approved by George D. Holton

TABLE 1

Waters Treated with Toxicant in Bull Creek Drainage and Toxicant Applied

| Water | Surface Acres | Acre Feet | Toxicant Applied (gallons) |
|---|---|---|---|
| Big Tupper Lake | 13 | 131 | 55 |
| Little Tupper Lake | 5 | 77 | 55 |
| Deadmans Lake | 10 | 59 | 30 |
| Browns Lake | 513 | 5326 | 1870 |
| Miscellaneous "potholes" | | | 75 |
| Bull Creek (below Deadmans) | | | 5 |

TABLE 2

Fish Species Found in Waters of Bull Creek Drainage

| Water | Yellow Perch | Long-nosed Suckers | Walleye Pike | Rainbow Trout | Silver Salmon | Cutthroat Trout | Eastern Trout |
|---|---|---|---|---|---|---|---|
| Big Tupper Lake | X | X | | | | | |
| Little Tupper Lake | X | | | | | | |
| Deadmans Lake | X | X | | X | X | X | |
| Browns Lake | X | X | X | X | X | | |
| Bull Creek | | X | | | | X | X |

JOB COMPLETION REPORT

DEVELOPMENT PROJECT

State of Montana

Project No. F-24-D-9

Job No. I

Name Western Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation - Bull Creek Drainage

Period Covered October 1, 1957 to September 1, 1958

## Abstract:

The Bull Creek drainage, located approximately 70 miles east of Missoula, was rehabilitated in October, 1957, and in April, May and August, 1958. Big Tupper, Little Tupper, Deadmans and Browns lakes; Deer Park and Bull Creek above Browns Lake; and Bull Creek between Browns and Kleinschmidt lakes were treated with liquid rotenone emulsives in October, 1957. Kleinschmidt Lake and Bull Creek between Browns and Kleinschmidt lakes were treated with liquid rotenone emulsives in April and May, 1958. Kleinschmidt Lake was retoxified with 60 percent toxaphene in August, 1958.

## Objectives:

The objectives of this job were to remove the yellow perch, suckers and yellow pike perch from the Bull Creek drainage, so that it could be restocked with trout.

## Techniques Used:

In October, 1957, the portion of the Bull Creek drainage, above the inlet of Kleinschmidt Lake (Big Tupper, Little Tupper, Deadmans, Browns Lakes and portions of Deer Park and Bull Creeks), was toxified with thirty-eight 55 gallon drums of Pro-Noxfish and Chem Fish Regular fish toxicant. Toxicant dispersion for the lakes was accomplished by the use of three 30-foot spray booms and one high pressure nozzle spray, mounted on outboard motor boats. Toxicant was mixed with water at the rate of 1:10, while it was being applied. Two shoreline areas of Browns Lake were too large and weedy for land or boat application of the toxicant, so were sprayed from an airplane. Toxicant was not premixed with water for aerial application.

Back pumps were employed to toxify the "pothole" areas near Browns Lake. Bull Creek was also treated with the use of back pumps.

Toxicant was applied to waters of this drainage section at the rate of one part toxicant to one million parts water, by volume.

Because effective barriers could not be maintained against an unexpected small (4-6") sucker migration in the spring of 1958, Kleinschmidt Lake was toxified on May 3, 1958, even though some of the yellow perch had begun their spawning by that time.

At this time of year, Kleinschmidt Lake contained a slightly greater water volume and covered more weed and shoal areas than would have been present had the job been done in the fall. Toxicant concentration was approximately .7 ppm with increased water volume and the amount of toxicant was not increased. Shoreline and weedbed areas were treated with a helicopter, which distributed 200 gallons of Pro-Noxfish, mixed 1 to 2 with water. The helicipter carried 30 gallons of toxicant (approximately 90-100 gallons mixture) per load and made seven trips. It applied toxicant at a slow speed (20-40 mph) and was able to cover the irregularly outlined shoreline and weedbed areas with ease.

Two hundred and seventy gallons of Pro-Noxfish were applied to the surface of the open water area of Kleinschmidt Lake by two distribution boats. Spray booms were not used. In one boat, toxicant and water were mixed through a double-intake, centrifugal pump at about 10:1 water to toxicant. This mixture pumped into the boat's wake. In the other boat, a length of 1/4 inch pipe was attached to the small bung of a toxicant barrel and the terminal end of the pipe trailed in the prop wash of the outboard motor. The barrel was mounted high enough in the boat to enable the toxicant to flow out of the pipe by gravity. A valve was installed in the distribution pipe to permit regulation of the amount of toxicant flow. This second boat could cover its distribution area at full speed, since no outboard water intake line was used to pre-mix water and toxicant.

On August 19, 1958, Kleinschmidt Lake was treated with nine gallons of 60 percent toxaphene. This was calculated to give a concentration of .01 ppm by weight, when thoroughly mixed. The inlet and outlet of Kleinschmidt Lake (Bull Creek) had ceased flowing at the time of this application, and should not glow again until the spring of 1959. The toxaphene was applied by one boat using the gravity method described above. Fifty gallons of water were pumped into a standard 55 gallon drum for each distribution trip. Five gallons of toxaphene were added for one trip, two for another trip, and one each for two more trips. Even at the concentration of 1 gallon toxaphene to 50 gallons water, the mixture left a "track" on the water, which was of sufficient density to enable the boat operator to distinguish his previous "swath" across the lake. The toxaphene was distributed over the surface of the open water area of the lake. None was sprayed over weedbed or shoreline areas. The long-lasting toxicity of toxaphene, coupled with the lack of inlet or outlet flow from this lake throughout the fall overturn period, should assure sufficient mixing in this body of water.

Table 1 shows the waters treated with toxicant and amount and kind of toxicants applied.

Browns, Deadmans, Big and Little Tupper Lakes were checked for toxicity, using rainbow trout in wire mesh live cages, in the spring of 1958. In a one week period, no mortality occurred in the live cars, which could be attributed to residual toxicity.

Browns Lake was qualitatively checked for plankton, and copepod adults and nauplii were found to be numerous in all samples. Big and Little Tupper and Deadmans Lakes were planted with 300/lb. rainbow trout at 500 per acre, in early spring. Browns Lake was planted with 700-800/lb. rainbow trout, at about 300 per acre, following the plankton sampling. A late summer plant of 300/lb. rainbow trout in Browns Lake brought the total plant up to slightly over 500 fish per acre. Deer Park Creek was planted with a small number of west slope cutthroat trout, in the summer of 1958.

Findings:

Seven fish species were found in the Bull Creek drainage. Table 2 lists these species and the waters in which they were found.

Large numbers of dead fish (mostly yellow perch and suckers) were observed in Browns Lake, after toxicant application last fall. In comparison, very few dead fish were found in Kleinschmidt Lake after it was treated this spring. This difference is likely due to the fact that Kleinschmidt, having approximately 10 feet less maximum depth than Browns, had winter-killed often enough to reduce its fish population.

The earthen, stockwater dam, below Browns Lake, was considered to be an effective barrier when the Bull Creek drainage treatment was halted there in the fall of 1957. However, high water in the spring of 1958 washed over the side of part of the spillway channel on this dam and rendered it useless as a barrier against an unexpected movement of small suckers out of Kleinschmidt Lake. Prompt treatment of the creek below Browns Lake prevented immediate reinfestation of Browns Lake at that time. The presence of many more small suckers in Kleinschmidt necessitated the immediate toxification of the lower portion of the drainage, down to the two-foot drop below the culvert, at the outlet of Kleinschmidt Lake.

A helicopter was employed to spray the weedbed and shoreline areas at this time, for the following reasons:

1. More weedbed and shoal areas were present during high water than during the fall low water period.

2. Assembling and disbanding spray crews and equipment for a single job, such as this, would have approximately doubled the manpower cost of the Kleinschmidt toxicant application.

3. The pressure of other work commitments necessitated accomplishing this job in the shortest possible time.

The helicopter charge for the application of 600 gallons mixed toxicant and water was $300.00. This charge would have been the same for applying 600 gallons of straight toxicant to the entire surface of the lake. Thus, had a good dispersing toxicant for aerial application been available, the entire lake could have been done for the same cost. Our experience had shown that the older emulsifiable rotenone formulations tended to drift along the surface of the water, when applied aerially without pre-mixing. Therefore, on this job all aerially applied toxicant was pre-mixed 1:2 with water. This increased the cost of aerial application three times over what it would have been, had straight toxicant been applied.

Three different methods of boat application of toxicant to open waters were used on the various waters of this drainage. These were: (1) Pumped, pre-mixed boom spray; (2) pumped, pre-mixed injection into the prop wash; and (3) straight toxicant injection into the prop wash by gravity. It is the concensus of the crews, who have used all three methods, that No. 3 is just as effective as Nos. 1 and 2 and is simpler and more economical, in both time and money. The lack of any necessity for an outboard intake line in method No. 3 permits full throttle operation, while distributing toxicant. Thus, even though the "track" of toxicant on the water surface is only about 1/2 as wide as methods No. 1 and 2, the boat can cover over four times as many "swaths" in a given length of time. It can cover an area in a series of criss-cross patterns that appears to give a better surface coverage than either method 1 or 2.

Recommendations:

1. Browns, Big and Little Tupper and Deadmans Lakes should be stocked again in 1959 and 1960 with rainbow trout fingerlings, according to the Montana specifications for the planting of rehabilitated lakes.

2. No immediate fishery should be planned for Kleinschmidt Lake.

3. Continued stocking of the drainage should be based upon investigation and recommendation by the fishery personnel responsible for the management of the drainage.

Prepared by: A. N. Whitney and R. C. Averett

Approved by George D. Holton
Assistant Coordinator

Date: September 23, 1958

## TABLE 1

Waters Treated with Toxicant in Bull Creek Drainage and Toxicant Applied

| Water | Surface Acres | Acre Feet | Emulsificable Rotenone Applied (gallons) |
|---|---|---|---|
| Big Tupper Lake | 13 | 131 | 55 |
| Little Tupper Lake | 5 | 77 | 55 |
| Deadmans Lake | 10 | 59 | 30 |
| Browns Lake | 513 | 5326 | 1870 |
| Kleinschmidt Lake | 240 | 1811 | 470 + 9 toxaphene |
| Miscellaneous "potholes" | | | 75 |
| Bull Creek (below Deadmans) | | | 5 |
| Deer Park Creek | | | 2 |

## TABLE 2

Fish Species Found in Waters of Bull Creek Drainage

| Water | Yellow Perch | Long-nosed Suckers | Yellow Pike Perch | Rainbow Trout | Silver Salmon | Cutthroat Trout | Eastern Brook |
|---|---|---|---|---|---|---|---|
| Big Tupper Lake | X | X | | | | | |
| Little Tupper Lake | X | | | | | | |
| Deadmans Lake | X | X | | X | X | X | |
| Browns Lake | X | X | X | X | X | | |
| Kleinschmidt Lake | X | X | | | X | | |
| Bull Creek | | X | | | | X | X |
| Deer Park Creek | | X | | | | X | X |

31839
#3

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

JOB COMPLETION REPORT
DEVELOPMENT AND OPERATIONS

State of Montana

Project No. F-24-D-8

Job No. I

Period Covered August 1, 1957 to April 30, 1958

Name Northeastern Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation - Whitetail Reservoir

## Abstract:

A program to eradicate with toxicants an undesirable population of bullheads and suckers in Whitetail Reservoir was carried out on September 19, 1957. Minnows and small suckers were observed in distress 30 minutes after application had begun, and larger suckers were seen lying along the shore about 3 hours later. Bullheads were slower to show the effects of the toxicant; rising first very slowly to the surface about 5 hours after the start of the application and collecting along the windward shore nearly 2 hours later. No northern pike or largemouth bass were seen or reported, although they were stocked in previous years. Surface temperature of the water warmed from 59°F to 61°F during the application period. Virtually all of the bullheads and a few of the suckers were taken by residents of the area. All fish observed on the day following application of the toxicant were in distress or dying. Five days later, no live fish were found in any part of the reservoir. It is recommended that largemouth bass be stocked in the reservoir as soon as they become available following a test of the toxicity of the water after spring run-off in 1958.

## Objectives:

To readicate an undesirable population of Suckers and Bullheads from Whitetail Reservoir and to restock with Largemouth Bass.

## Techniques Used:

Two boats were used in applying toxicant to the 25 acre reservoir. One boat towed sacks of Fish-Tox over the deeper portion of the water in a criss-cross pattern. The other boat, equipped with a motor-driven pump, covered the shoreline area and the shallows, spraying with Pro-Noxfish. Concentration of the Pro-Noxfish was regulated by valves installed on the pump intake. An Indian back pump was used to apply toxicant to several small potholes in the drainage immediately above the reservoir. Results of the eradication project were investigated on the day of the application, again on the following day and again five days later on September 25, 1957.

Findings

Total time taken to apply the toxicant was 3½ hours, 12:30 p.m. to 4:00 p.m. on September 19, 1957. Surface water temperature warmed from 59° to 61° F. during the 3½ hour period. Within 30 minutes after application had begun, minnow species and small suckers were observed in distress; by the time application was completed, many of the larger suckers were lying along the shore. The bullheads took considerably more time to show the effects of exposure to the toxicant; the first were observed rising very slowly to the surface shortly after 5:00 p.m. By 7:00 p.m. bullheads were beginning to accumulate along the rock face of the dam on the east end of the reservoir. Fish-hungry spectators, wielding garden rakes, pitchforks, and long handled homemade dip nets began taking out bullheads (and a few suckers) almost as soon as they appeared. The landowner, Mr. Wiley, said he had heard people people coming for fish all night, and had watched them from midnight on. At 7:00 a.m. of the following morning he estimated that over 1,000 pounds of bullheads had been taken out during the time he had watched.

On the 20th of September all fish observed were in distress or dying. In traveling the entire length of the shoreline, no healthy, active fish were seen.

On the 25th of September no livefish were found in any part of the reservoir. The shores were covered with dead suckers in the first stage of decomposition.

No northern pike nor largemouth bass were observed or reported, although they had been stocked in previous years. It is possible, however, that some may have been found and picked up during the night.

Assistance in the project was given by Warden Supervisor, Tom Hay, Game Manager, Dick Trueblood and Warden, Peter F. Quiring.

Recommendations:

That a test of the toxicity of the water in the reservoir be made following spring run-off in 1958, and that largemouth bass be stocked when they become available.

Prepared by William Alvord

Approved by GEORGE D HOLTON

Date November 1, 1957

BIB #1
#2

# JOB COMPLETION REPORT
# INVESTIGATIONS PROJECT

State of Montana

Project No. F-24-D-7

Job No.

Name Western Montana Fishery Study

Title Statewide Lake & Stream Rehabilitation - Upsata Lake

Period Covered: September 15 through September 30, 1957

Abstract: Upsata Lake, located approximately 50 miles northeast of Missoula, Montana was rehabilitated on September 19 and 20, 1957. A total of 495 gallons of Chem Fish Regular and 75 gallons of Chem Fish Special was applied to the 89-acre lake.

Two 30-foot spray booms and one spray nozzle, mounted on outboard motor boats, were used to apply the toxicant.

Objectives: The objectives of this job were to remove the existing population of yellow perch from Upsata Lake and to restock the lake with rainbow trout.

Techniques Used: Upsata Lake covers an area of 89-surface acres and contains 1217-acre feet of water. The maximum depth of the lake is 40 feet; however, the greater portion is 25 feet deep, or less.

Prior to the rehabilitation, four 125-foot gill nets were placed in Upsata Lake and "fished" overnight. These nets were placed in water ranging from 10 to 40 feet in depth. A repeat netting in the same locations was carried out after the lake had been toxified.

On September 18 the lake was marked into sections and the 20-foot contour line was marked off by buoys. Water volumes and toxicant amounts for each section were calculated.

Two types of toxicant were applied to Upsata Lake. Chem Fish Special, a deep water toxicant, was applied at the rate of 0.7 parts per million to all water within the 20-foot contour line. A total of 75 gallons of this toxicant was used. Chem Fish Regular was applied over the entire lake at the rate of 1.4 parts per million, 0.7 parts per million of the Chem Fish Regular was applied on the first day of the rehabilitation (September 19) and the other 0.7 parts per million applied the following day (September 20).

A total of 495 gallons of Chem Fish Regular was applied to the lake.

Two 30-foot spray booms and one nozzle spray, mounted on outboard motor boats, were used to apply the toxicant. The nozzle spray was used to cover the weedy shoreline areas, which were inaccessible to the spray booms.

The toxicant was mixed with lake water at the rate of 1:10 as it was being applied.

Findings:

On September 19 and 20, 1957, Upsata Lake was rehabilitated. A total of 570 gallons of toxicant was applied to the lake.

Yellow perch were noted in distress within 30 minutes after the toxicant application was started, and these fish continued to die throughout the time the toxicant was being applied. Yellow perch were the only fish species observed.

Four overnight gill net sets, made prior to the rehabilitation contained four to thirty fish (yellow perch) per net set. These same net sets were repeated shortly after the rehabilitation and no fish were taken.

A vertical temperature series was taken several days before the rehabilitation began and showed a rather indefinite thermocline present at 20 to 30 feet. During the application of the toxicant, surface temperature ranged from 56° to 58°F.

Restocking of the lake with rainbow trout fry will be carried out this spring (1958) at State expense.

Recommendations:

It is recommended that Upsata Lake be planted with rainbow trout fry (500/lb. or larger) in 1958 and periodically thereafter, as the need arises. Yearly population samples should be made with gill nets to determine the effectiveness of the rehabilitation project and the necessity for future plantings.

Prepared by R. C. Averett

Approved by George D. Holton

Date April 25, 1958

B1339
#1

JOB COMPLETION REPORT
DEVELOPMENT PROJECT

State of Montana

Name Northwestern Montana Fishery Study

Project No. F-24-D-6

Title Statewide Lake and Stream Rehabilitation - Sophie Lake

Period Covered: May 1, 1957 to April 30, 1958

Abstract: Sophie Lake was rehabilitated on October 2, 1957. Squawfish, largemouth bass, coarse-scaled suckers, pumpkinseed sunfish, cutthroat trout, ling and redside shiner were found.

Objectives: The primary objective was to eliminate the present population of fish and to develop a trout fishery.

Techniques Used: Three boats using an awkward arrangement of spray booms were used to dilute the toxicant and spray it over the surface of the lake. One crew used a fire pump to spray the shallow and weedy areas of the lake. The lake was rehabilitated on October 2, 1957. On November 7, 1957, with the aid of the local game warden, the inlet stream was rehabilitated. Some international problems arose but were taken care of. The inlet stream drains an area just north of the International Boundary and special arrangements had to be made with the fisheries biologist in Cranbrook, British Columbia. The stream flows to the lake only during the run-off in the spring and is dry the remainder of the year. The toxicant was introduced into the stream at the base of about an eighty foot falls. At time of rehabilitation no water was flowing into Montana.

Findings: Many fish were destroyed in this lake. A total of 1,045 gallons of "Pro-Noxfish" and 660 gallons of "Chem-fish-special" was used. This lake is over 50 feet deep and the "Chem-fish-special" was used in the deep areas.

The following fish were found dead in the lake:

Cutthroat trout - Salmo clarkii
Largemouth black bass - Micropterus salmoides
Squawfish - Ptychocheilus oregonensis
Coarse-scaled suckers - Catostomus macrocheilus
Pumpkinseed sunfish - Lepomis gibbosus
Burbot - Lota lota maculosa
Redside shiner - Richardsonius balteatus

It is hoped that a complete kill was obtained.

Recommendations: It is recommended that this lake be sampled periodically to determine if a complete kill was obtained. It is also recommended that this lake be planted until it is determined whether the inlet stream is satisfactory for spawning purposes. It is further recommended that officials of the British Columbia Game Department be contacted about planting in inlet streams.

Prepared by: Frank A. Stefanich
Date April 30, 1958

Approved by: George D. Holton

131838
#16

# JOB COMPLETION REPORT
# DEVELOPMENT PROJECTS

State of Montana

Name Western Montana Fishery Study

Project No. F-24-D-5

Title Statewide Lake and Stream Rehabilitation
Rainbow (Dog) Lake

Period Covered: May 1, 1957 to April 30, 1958

Abstract: Rainbow Lake was rehabilitated on September 28, 1957. The tributary stream was rehabilitated on September 27, 1957. To assure a complete kill in the tributary drainage, it was sprayed by an airplane on September 29, 1957. Walleye pike, rainbow trout, pumpkinseed sunfish, squawfish, black bullheads, redside shiners, coarse-scaled suckers, Columbia River chubs and yellow perch were found dead along the shore.

Objectives: The primary objective was to destroy the existing populations of fish in Rainbow Lake and develop a trout fishery.

Techniques Used: The beaver dams in the tributary stream were blown and the stream made toxic the day before the main lake was rehabilitated.

The lake was rehabilitated on September 28, 1957. Three boats rigged with spray booms distributed toxicant in specified areas. Two fire pumps were used to spray toxicant in shallow areas and the shore area. This lake was done on a Saturday so that the public could observe the area and also the crew had to work every day to get all required work done. A game warden was instructed to keep the public off the lake. Application of the toxicant was started about 8:00 A.M. and was completed by 3:00 P.M. However, the crews on the shoreline pumps worked all day. A great number of fish were killed but it was impossible to make any sample counts due to the huge number of people picking up all species of fish around the entire shore line of the lake.

A total of 1,455 gallons of toxicant was used.

Findings: Many fish were killed in the lake. The spray booms were rather awkward to work with and it is felt that a more simple device could be used. The following species of fish were killed in the lake:

Yellow pike perch (Walleyed pike) - Stizostedion vitreum
Rainbow trout - Salmo gairdnerii
Pumpkinseed sunfish - Lepomis gibbosus
Squawfish - Ptychocheilus oregonensis

Black bullheads - Ameiurus melas
Redside shiner - Richardsonius balteatus
Coarse-scaled sucker - Catostomus macrocheilus
Columbia River chub - Mylocheilus caurinus
Yellow perch - Perca flavescens

It is hoped that there was a complete kill.

Recommendations: It is recommended that this lake be sampled periodically to determine if a complete kill was obtained.

Prepared by Frank A. Stefanich

Approved by George D. Holton

Date April 30, 1958

MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION

HELENA, MONTANA

31B38
#15

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-24-D-4 Name Southwestern Montana Fisheries Study

Job No. I Title Statewide Lake and Stream Rehabilitation-Fairy Lake

Period Covered: September 1, 1957 - April 30, 1958

## Abstract:

Fairy Lake, a 11.5 acre mountain lake, was surveyed, the fish population sampled, and the lake chemically treated. A large population of suckers was removed. Subsequent netting indicated the rehabilitation was successful. Catchable size rainbow trout were stocked into the lake.

## Objectives:

Fairy Lake provided poor fishing and the rehabilitation job was undertaken to remove a population of suckers which were introduced by minnow fishermen.

## Techniques Used:

The lake was surveyed, sounded and a map prepared from this data. Total volume of the lake was calculated from this map.

Gill net samples were made to determine the fish population in the lake. A boat and pump were used to apply the fish toxicant (pro-noxfish) which was applied at a rate of 0.8 ppm.

Test netting was conducted to check on the success of the toxicant and a live box installed to check for residual toxicity.

## Results:

### Description of the Lake

Fairy Lake is located in the Bridger Mountains at an elevation of 7,549 feet. It is approximately thirty-five miles from Bozeman in T2N, R6E, Sec. 22, 23 of Gallatin County in the Gallatin National Forest. There is good access and a Forest Service campground on the lake. This area is extremely popular with the people in the surrounding population centers of Bozeman, Livingston, Clyde Park, and Wilsal.

The esthetic values of the area must be rated as high. A small spring stream has been diverted into the lake. The outlet of the lake forms Fairy Lake Creek. Fish are unable to move into the lake from Fairy Creek due to the steep gradient. Fairy Lake has an area of 11.53 acres and contains 224 acre feet of water with a maximum depth of 40 feet. The bottom is composed of sand, mud, and rubble with little vegetation. Spawning gravel is inadequate to maintain a fishable trout population.

## Fish Population

Twenty-eight net hours with 125-foot experimental gill nets on June 8-9, 1957, resulted in the capture of 91 suckers, (84%) and 16 brook trout (16%). The brook trout netted were large (average length 15.1 inches, range 14.0 inches to 17.6 inches). This size trout were scarce however and had contributed little to the creel.

In the fall of 1957, pro-noxfish was applied to the lake at a rate of 0.8 ppm. Observations of the fish kill indicated excellent results. Two boat crews managed to recover 52 trout. Fifty percent brook and fifty percent rainbow. Numerous suckers were observed in distress but time did not permit an estimate as to numbers.

On June 18-19, 1958, two experimental gill nets were set for a total of 48 net hours and no fish were captured. Visual examination of the shoal areas revealed no fish so it is assumed the chemical treatment successfully eradicated all fish present. Rainbow trout survived two weeks in a live box indicating the water was no longer toxic. A visual check indicated a fair population of amphipods in late June.

A total of 4,500 catchable size (5 to 6 per pound) rainbow were stocked on July 8, 1958. Limited creel checks indicate good fishing success to date. It is anticipated that heavy use will be made of the area the remainder of the season.

## Recommendations:

The most economical management of this lake would be to maintain the population through periodic stocking of fingerling trout (preferably cutthroat).

It is therefore recommended that this lake be managed by stocking of cutthroat fingerling trout every three years. However, due to the ease of access, lack of spawning areas, and low productivity, it is recommended that subsequent observations of these cutthroat plants be made to determine their effectiveness and determine changes should they become necessary.

Prepared by: Boyd R. Opheim

Approved by: George D. Holton

B1B38
#14

# JOB COMPLETION REPORT

# DEVELOPMENT PROJECT

State of Montana

Name Northwestern Montana Fishery Study

Project No. F-24-D-3

Title Statewide Lake and Stream Rehabilitation - Milnor Lake

Period Covered: May 1, 1957 to April 30, 1958

Abstract: This lake was not rehabilitated due to lack of obtaining access.

Objectives: The primary objective was to eliminate the present population of fish and to develop a trout fishery.

Techniques Used:

No work done.

Findings: The owner of almost all of the lakeshore lives in Seattle, Washington. A lawyer in Libby was handling the access to the lake for the owner so that the Fish and Game Department could rehabilitate the lake. However, the lawyer developed cancer during the summer and died in January of this year.

Recommendations:

It is recommended that this project be amended and be continued for another year. Attempts will again be made to get access.

Prepared by: Frank A. Stefanich

Approved by George D. Holton

Date: April 30, 1958

MONTANA DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

#13

JOB COMPLETION REPORT
DEVELOPMENT PROJECT

State of Montana

Name Northwestern Montana Fishery Study

Project No. F-24-D-3

Title Statewide Lake & Stream Rehabilitation - Milnor Lake

Period Covered: May 1, 1958 to March 30, 1959

Abstract: An aerial type spray was applied by a helicopter on August 21, 1958. Carp, pumpkinseed sunfish and large mouth black bass were killed in the lake. Two overnight gill net sets were made on February 17, 1959, and no fish were caught.

Objectives: The objective was to eliminate the population of carp and pumpkinseed sunfish and develop a trout fishery.

Techniques Used: S. B. Penick and Co. furnished a toxicant that could be aerially applied, and at no cost to the Department. On August 21, 1958, toxicant was sprayed on the lake by a helicopter. A total of 250 gallons of aerial fish toxicant was used. Application was started at 7:00 A.M. and was completed by 11:00 A.M. It took more time to fill the helicopter with toxicant than it took to spray the liquid. No water was mixed with the toxicant.

Bass and sunfish were seined the day previous to application of toxicant and placed in live cars. However, by the morning of application, most of these fish were dead, probably due to too much handling by local youngsters swimming in the lake.

Findings: The sunfish and bass were killed shortly after the first spray-run on the lake. Carp were in distress before all the toxicant was applied.

The following species of fish were killed in the lake:

Large mouth black bass (Micropterus salmoides)
Pumpkinseed sunfish (Lepomis gibbosus)
Carp (Cyprinus carpio)

Local residents reported fish breaking surface water several months after application of the toxicant. Two overnight sets were made with 125 foot sampling gill nets on February 17, 1959, and no fish were caught.

Recommendations: It is recommended that this lake be sampled periodically to determine whether a complete kill was obtained. Since no spawning area is present for trout, it is further recommended that this lake be planted every year.

Prepared by: Frank A. Stefanich Approved by George D. Holton

Date: March 16, 1959

B1838
#12

# JOB COMPLETION REPORT

## DEVELOPMENTS AND OPERATIONS

State of Montana

Project No. F-24-D-2

Job No. I

Name Southeastern Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation - Colstrip Pond #1

Period Covered: Sept. 1, 1957 to April 30, 1958

Abstract:

On September 24, 1957, Colstrip Pond #1 was treated with 55 gallons of Chem Fish Special, a commercially prepared fish toxicant sold by the Chemical Insecticide Corporation. Fish were observed in distress almost immediately following the first application of toxicant. About 24 hours after application of the toxicant all the fish that could be visually observed were dead.

Objectives:

Colstrip Pond #1, formed in an abandoned coal strip mine, is owned by the Northern Pacific Railway Company and maintained for recreation of the Colstrip and surrounding communities. Management has consisted of fish planting, regulations, and some attempts at fertilization. Prior to keeping fish planting records in 1950, the pond had been stocked with pumpkinseeds, perch, bullheads and bass. Gill net sets in 1950 indicated a stunted population of most of the above species. Since 1950 approximately 15,000 walleye pike and 10,000 northern pike have been planted (to eat the stunted fish). Gill nets sets in 1957 indicated a stunted population similar to those in 1950, with no trace of walleye pike or northern pike. Regulations have varied from closing the pond for a season to let the little fish grow larger, to opening the pond for the entire year to catch the little fish that did not grow larger. Verbal reports say the pond has also been fertilized to make the fish grow larger. The Fish and Game Department undertook rehabilitation of the pond and will attempt to restock it with trout in 1958.

Techniques Used:

Since the pond contained a population of bullheads and is fed by underground seepage, the commercial fish toxicant, Chem Fish Special, was used. This toxicant was selected because of dispersal characteristics that give a slight advantage for killing bullheads. Toxicant application was made with hand pumps and a motor operated pump from a boat. The hand pumps were used on the shoreline and in weedy areas where the boat could not operate close enough to be reached by spray from the motor driven pump. An attempt was made to use this pump for open-water application. The pump was not suited for this, and a direct hose connection was made between toxicant barrel and the water, and the toxicant was run directly into the propwash of the outboard motor. This resulted in a faster application, which appeared as adequate as using the spray pump.

Findings:

During the time of application of toxicant and resulting fish kill, the water temperatures varied between 56° and 60° F. The maximum depth of the pond was 20 feet. Small pumpkinseeds and perch were observed in distress along the shoreline almost immediately after toxicant application began. The interval between toxicant application and the first observations of bullheads in distress was approximately 6 hours. About 24 hours after toxicant application, all fish that could be visually observed were dead. To date no attempt has been made to determine the completeness of the kill.

Conclusions and Recommendations:

Chem Fish Special dispersal is rapid and its tendency to accumulate near the bottom is of value in poisoning fish, such as bullheads, that normally remain near the bottom. The tendency of this toxicant to rapidly settle to the bottom leaves some question as to how long surface water remains toxic. In problem waters it may be desirable to use a combination of Chem Fish Special and Pro-Noxfish. Pro-Noxfish dispersal rates appear to be much slower and might keep the upper water toxic longer than Chem Fish Special.

The present equipment for applying toxicant in open water is not satisfactory, especially in a 12-foot boat. Experimentation and development of such equipment is desirable.

Prepared by Perry H. Nelson

Date March 15, 1958

Approved by George D. Holton
Assistant Coordinator

# JOB COMPLETION REPORT

B1832
#11

## DEVELOPMENTS AND OPERATIONS

State of Montana

Project No. F-24-D-1

Job No. I

Name Southeastern Montana Fishery Study

Title Statewide Lake and Stream Rehabilitation - Tongue River Reservoir

Period Covered: Sept. 1, 1957 - April 30, 1958

Abstract: The Tongue River Reservoir and 20 miles of the Tongue River were chemically treated in 1957 to remove as many undesirable fish as possible. This will be followed by stocking rainbow trout in the spring of 1958 in an attempt to duplicate the fishing following initial impoundment of reservoirs.

The reservoir was lowered to dead storage (217 surface acres, with 1,400 acre-feet of water) by the State Water Conservation Board. Pro-Noxfish and Fish-Tox were used as fish toxicants. The bulk of the Pro-Noxfish was aerially applied. Many problems not encountered in treating natural lakes were encountered in treatment of reservoirs lowered to dead storage.

Objectives: The Tongue River Reservoir is an irrigation storage reservoir built by the State Water Conservation Board. Much of the storage water is unsold for irrigation purposes, which results in a relatively stable water level.

Because of its location and size, it has a sport fishing potential. This project was undertaken to rehabilitate the reservoir and some of the river above the reservoir. This is expected to give a temporary advantage for stocking game fish and perhaps duplicate conditions similar to those following initial impoundment of the reservoir.

Techniques Used: The reservoir has a maximum size of approximately 3,500 surface acres and a storage capacity of 69,439 acre-feet of water. To facilitate and make economically feasible the rehabilitation of the reservoir, the State Water Conservation Board cooperated and lowered the reservoir to dead storage, 217 surface acres with about 1,400 acre-feet of water.

Approximately 770 gallons of Pro-Noxfish was used to treat the reservoir and 20 miles of the Tongue River above the reservoir. Practically all of the Pro-Noxfish was applied with an airplane equipped with a Sorenson Spray Unit. Small amounts were applied with a hand spray pump in small inlets and some accessible sloughs. Approximately 1,370 pounds of commercial fish-tox were applied by towing it in sacks behind a motor boat.

The Pro-Noxfish was applied undiluted from the airplane for reasons of economy in the number of airplane trips. The pilot was furnished a contour map of the reservoir and the amount of toxicant needed in various sections of the reservoir. The sections were distinguishable by surrounding landmarks and buoys. No flag men or markers were needed to guide the pilot. The toxicant left a prominent oil slick on the surface of the water. For treating the river portion the nozzles on one side of the spray booms were removed so the chemical would not be broken into a spray.

Application of the fish toxicant by airplane was necessary because the remaining water in the reservoir was surrounded by almost impassable mud flats and shallow slough areas. Numerous old trees (standing and fallen) were exposed in the draw-down that would have further complicated the application of fish toxicant from a boat. The dike was the only area where access could be readily gained to the water.

In the case of the Tongue River Dam, an old railroad grade appeared in the bottom making it possible to drive a truck down off the dike and near the remaining water. Had it not been for this railroad grade, it would not have been possible to get a motor vehicle within 200 yards of the remaining water.

During the time of toxicant application it was necessary to release 120 cfs down stream. Because of the position of the outlet structure, and water temperatures during toxicant application, it appeared that this water was flowing off the surface of the reservoir. This, coupled with the tendency of Pro-Noxfish to remain on the surface for a period following application, resulted in an area around the outlet that was relatively non-toxic because of loss down stream. A fish kill was observed below the dam following the first application of toxicant near the outlet structure.

Due to possible loss of toxicant in the outlet area, and large numbers of carp and goldfish still alive in the outlet area two days following application of Pro-Noxfish, approximately 1,370 pounds of fish-tox were applied. At the time of this application many of the fish showed visual signs of distress; however, about six hours following fish-tox application, all fish that could be observed were showing definite distress actions. No live fish could be visually observed 10 days later.

Pro-Noxfish was judged inadequate for aerial application in undiluted form. The manufacturer recommends emulsifications of Pro-Noxfish prior to application, probably because of its tendency to float on the surface of the water. The cost of application by air would be increased proportional to the amount of pre-emulsification, since cost of application is increased proportional to the amount applied per surface acre. In only one isolated instance a small amount of wind-rowing of the chemical was noted. Wind was not blowing at the beginning of the toxicant application, and only a slight wind (probably less than 3 mph) was blowing when application was complete. The slight water agitation by the wind following toxicant application appeared to aid the downward dispersal of floating Pro-Noxfish.

Various experiments hint at possible effect of silt on fish toxicant. Some question as to the effect of the toxicant was experienced where the tributaries were cutting through banks of silt deposited below the normal level of reservoir operations. Fish kills were observed in the reservoir where the silt laden water was entering the reservoir; however, application was made in excess of 1 ppm in the turbid portions of the reservoir. The portions of the tributaries in the silt deposition beds were not observed since they were not accessible.

During the project 15 species of fish were observed; carp, bullheads, goldfish, crappies, yellow perch, rock bass, golden shiner, redhorse sucker, common white sucker, longnose dace, large mouth bass, rainbow trout, brown trout, sauger (or walleye) and stone cat. Carp and goldfish were estimated to be 99 per cent of the fish population by weight. Goldfish could be found in colors varying from bright gold to a dark brown similar in color to the carp. Carp were of uniform size, between 14-16 inches long. Only a few young of the year carp were observed. The only brown trout observed were found immediately below the dam. They were abundant for approximately 1/4 mile below the dam. All sizes of brown trout were seen. This is particularly interesting since this area had been poisoned with fish-tox in 1955 and stocked with walleye. Since 1955 no records of brown trout stocking can be found. Possibly brown trout survived this poisoning in the egg stages. No walleye were observed that could be attributed to a stocking in 1955. Also no catfish were observed from the reported plant in the Tongue River in Wyoming in 1956. No chemical was applied into the river below the dam; however, a fish kill occurred in 14 airline miles of river below the dam. One rainbow trout and one sauger (or walleye) were observed in the reservoir.

Application of fish toxicant by airplane has many advantages, especially when poisoning large reservoirs that have been partially drained. The main advantage is it provides a way to apply toxicant in the shallow sloughs and bays isolated by extensive mud flats and shallow water. In the Tongue River Reservoir old cottonwood trees were exposed in the drawdown. Applying toxicant in the cottonwoods may have been a problem without an airplane. In addition to this the method is rapid, and only a small crew is needed. Unfortunately air application also has some district disadvantages. Fish toxicant, applied in a manner similar to insecticides, is subject to drift. To date fish toxicants have not been designed specifically for aerial application. Pro-Noxfish is not satisfactory for aerial application in undiluted form. Perhaps it would be in pre-emulsified conditions; however, this would increase cost of application. Spray pilots also have a tendency to want to atomize the toxicant as they do when spraying insecticides. To be successful,a small amount of insecticide has to drift onto practically each blade of grass or leaf. Such is not the case with a fish toxicant that will disperse in water.

In a later application of a different toxicant on another body of water, the nozzle orifices were removed leaving one-eighth inch holes in the nozzles. In this case the toxicant was applied with relatively little drift, since it was put out in drops rather than fine spray. The pilot still had control of the amount of toxicant applied per acre through the pressure in the spray unit and speed of the airplane.

Recommendations: Conditions encountered in rehabilitating drawn-down irrigation reservoirs are probably similar in other reservoirs and should be considered when planning such a project. Extensive mud flats and shallow sloughs are exposed by draw-down of water levels, leaving application by air about the only feasible method of applying toxicant. Time is also of importance in these projects. In this case the State Water Conservation Board wished to begin reimpoundment of water as soon as possible. Turbid water becomes a problem, especially around inlets and in creeks flowing through areas of silt deposition below the normal operation levels of the reservoir.

The position of the outlet structure in relation to remaining water levels and temperatures should also be considered. About 120 cfs were needed down stream during this project. Since the reservoir was at dead storage, the outlet was taking surface water, and it appeared that much of the toxicant applied in the vicinity of the outlet was almost immediately lost down stream.

From observations on this project, it is believed a toxicant designed for aerial application would be desirable. Characteristics of the toxicant should include reasonable costs, quick dispersal qualities, less bulk, and a higher specific gravity than the Pro-Noxfish used on this project.

Considering the tremendous amount of dilution from refilling a reservoir, toxaphene might be better and more economical fish poison. In an experiment on another reservoir, the concentrate toxaphene was pre-emulsified so the pilot could get the desirable distribution; however, the total amount of water and toxaphene was still about one-half the amount of undiluted Pro-Noxfish needed to treat this reservoir.

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